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Interior of Terra Bella Booster Station, No. 4.

Booster Pumping Station—Terra Bella Irrigation Project.

Operating Features of a California Pumping Project

Terra Bella Irrigation System Operated Entirely by Motor-Driven Pumps Supplied by Central Station

THE Terra Bella Irrigation System, in Southern California, the first of its kind to be built on so large a scale, is operated entirely by electricity, with five zones, served by boosting stations, augmented by reservoirs.

After careful investigation of the relative merits of a water supply developed by gravity storage reservoirs, or by pumping from deep wells, it was decided to utilize the latter method of development.

The water derived from the wells is distributed to the land through a system of main and lateral pressure pipes by means of a series of boosting pump stations, which deliver the water to the land in zones at different elevations. The elevation of the ground surface in the district increases from the western to the eastern boundaries and varies in actual elevation above the sea level from 452 feet at the main pumping station to an elevation of 811 feet at the highest point of pump delivery in the balancing reservoir (from which water will flow to the highest lands along the eastern margin of the district.

The number of pumping stations at present installed is five. These are known as the main pumping station, booster No. 1, booster No. 3, booster No. 4, and booster No. 5.

The equipments on the various deep wells consist of multistage, deep well, turbine pumps, directly connected to vertical ball-bearing electric motors.

All of the pumps are set at a depth of 50 feet below the ground surface with a suction limit of 70 feet. Six of the wells are equipped with pumps with a capacity of 50 miner's inches and directly connected to 20-hp. electric motors. The average lift for all of these plants from the water in the wells when pumping to the surface of the filled reservoir at the main pumping station will be 108 feet.

Each well pumping plant is housed in a neatly constructed frame building 10 by 10 ft. in size with a permanent derrick to be used for the repair or removal of the pumps and motors.

All of these separately operated deep-well pumping plants deliver the water into the same main delivery pipe, which discharges into a receiving reservoir at the main pumping station. This reservoir at the main pumping plant has a capacity of about 40 acre-feet, and is of sufficient size to take a constant flow from the wells and equalize the varying discharge from the main pump station into the distributing pipe system.

Main Pump Station.

The main pumping station building, like the buildings for all of the stations, is built of hollow tile with plastered walls, with a tar and gravel roof, and is not only permanent and durable in construction, but presents a very neat and artistic appearance.

The building is 30 by 53 ft. in size and makes provision not only for the pumping units now installed to take care of the present needs of the district, but

for three additional units to be installed at some future time. The present pumping installation in this station consists of two 2500 gallon-per-minute and one 3040 gallon-per-minute horizontal single-stage, centrifugal pumps, directly connected to 125-hp. electric motors.

These pumps draw their water from the receiving reservoir supplied from the main delivery pipe leading from the valley wells. The elevation of this reservoir when full is 462 feet, and the elevation of the floor of the main pump station is 465.5 feet.

The water delivered by the pumps from this station is measured through a 30-in. Venturi meter, the recorder for which is placed in the station. The station throughout is equipped with a modern switchboard, control apparatus, motor and compressor for priming pumps.

The ultimate head under which this station will operate when delivering its full volume of water of 2750 miner's inches is estimated to be 120 ft., and the present installed pump capacity of the station is 894 miner's inches.

Equipment of Booster Station No. 1.

This pump station is an exact duplicate of the main pumping station except that the pumps are slightly

Electric Signal Station.

smaller to make allowance for water diverted to irrigating land in the zone between the two stations. The pumping equipment consists of two 1800 gallon-per-minute and one 2400 gallon-per-minute horizontal, single-stage centrifugal pumps, directly connected to 125-hp. electric motors.

The pumps draw water from a receiving reservoir, which is supplied from the main pipe leading from the main pumping station. This reservoir has a capacity of about 12 acre-feet, and is sufficiently large to equalize the variations in flow from the two stations. The elevation of the water surface in the reservoir when filled is 526 feet and the elevation of the floor in the pump is estimated to be 187 feet. The present installed pump capacity is 666 miner's inches. Water from this station is measured through two Venturi meters.

Booster Station No. 3.

This station receives its water from the infiltration gallery and wells in the bed of a creek. The pumping equipment consists of two 1125 gallon-per-minute horizontal, single-stage centrifugal pumps, directly connected to 75-hp. electric motors.

The water from the infiltration gallery and wells is delivered into a sump 8 ft. in diameter by 15 ft. deep beneath the floor of the pump station, from which it is drawn by the pumps. This boosting station will be used to supply all winter water in this district, both for domestic and irrigation use, and will be operated throughout the year, except during the late summer, at its full capacity. The pumps in this station will deliver water into the receiving reservoir at boosting station No. 4, from which one of the units will be interchangeably and automatically electrically controlled for starting and stopping.

The elevation of the floor of the pump station is 541 ft. and when pumping its full capacity of 250 miner's inches the pumps will be delivering against a head of 170 ft.

Booster Station No. 4.

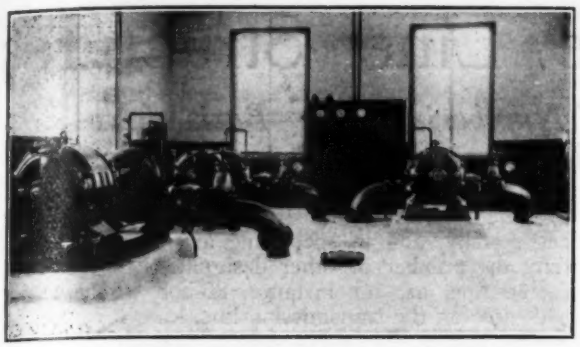
This station will receive its water from a receiving reservoir, into which both booster stations Nos. 1 and 3 will discharge. This receiving reservoir will act as the control element for the operation of the pumps at booster stations Nos. 1 and 3, this control being maintained by an elaborate system of automatic indicators and signals and automatically controlled starting devices.

The pumping equipment consists of one 575 gallon-per-minute horizontal, single-stage, centrifugal pump, directly connected to a 20-hp. electric motor, and one 900 gallon-per-minute horizontal single-stage centrifugal pump, directly connected to a 60-hp. electric motor. These pumps will deliver to two zones under heads of 80 and 160 ft., respectively. The larger pump will deliver water to a balancing reservoir at an elevation of 811 ft. This reservoir is a concrete-lined basin 18 by 50 ft. in size with a capacity of 40,000 gallons. The pump will be automatically controlled by an electric float switch placed in this reservoir and as an additional safeguard to prevent overflow of the reservoir a balanced valve is installed in the pipe line, which will be automatically closed when the reservoir is filled.

The receiving reservoir at booster station No. 4 will act as a balancing reservoir to regulate the discharge of the pumps at boosting station Nos. 1 and 3, and in this way it will serve as the regulating reservoir for the supply of water to all portions of the district except those supplied from booster stations Nos. 4 and 5.

Booster Station No. 5.

This station will draw its water from the receiving reservoir supplied from booster stations Nos. 1 and 3. The pumping equipment consists of one 540 gallon-per-minute horizontal single-stage, centrifugal pump, directly connected to a 30-hp. electric motor, and one 910 gallon-per-minute horizontal single-stage, centrifugal pump, directly connected to a 50-hp. electric motor. The smaller motor and pump are automatically controlled by a pressure regulating switch tied into the high-pressure side of the pump.



Main Pumping Station, Terra Bella Project.

Provision is made in this station for an additional unit to be installed later.

All of the mechanical equipment in the various pump stations is of the very latest type and will operate with a maximum of efficiency.

The above described plant provides the equipment for furnishing water to the district covering an area of 12,000 acres, for the first few years of its development. Certain portions of the system, such as pump-station buildings and main pipe lines, are complete for the entire development of the district, and provide for future increase in the water supply by putting down of additional wells as they may be required.

SPECIFIC INDUCTIVE CAPACITY OF PAPER.

Effect of Temperature and Impregnation Upon Capacity.

By H. C. P. Weber and T. C. MacKay.

The September issue of the *Journal of the Franklin Institute* contains an interesting communication from the research laboratory of the Westinghouse Electric & Manufacturing Co. on the effect of temperature and impregnation upon the specific inductive capacity of paper.

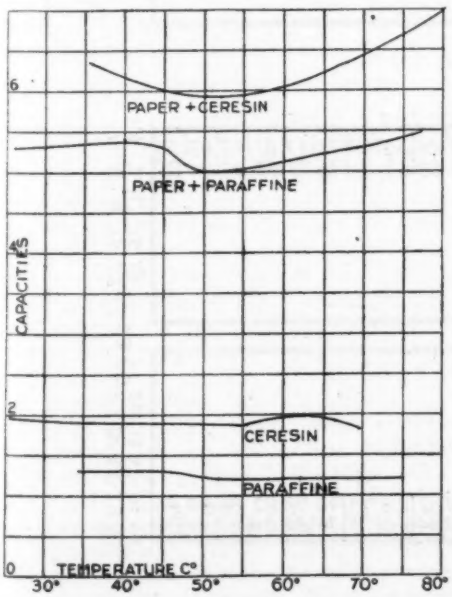


Fig. 1.—Changing Specific Inductive Capacity With Temperature

The object of this work was to obtain preliminary information on a number of materials. The first measurements were made by a substitution form of series resistance method, with high-frequency generator and telephone. Silence in telephone was difficult to obtain due to harmonics. An Einthoven galvanometer proved less sensitive to changes in the resistance and the eye strain in the detection of very small currents is great.

In order to make a large number of measurements to determine quickly the order or magnitude of the specific inductive capacities, the simple bridge method in which two arms are resistances and the other two capacities was used. In this bridge R_1 and R_2 each are 9000 ohms, C_s is the condenser containing the sample, and C a calibrated air condenser. The sample holder consisted of two massive iron electrodes kept at a definite separation by small glass stops. The capacity of the sample holder as an air condenser was calculated from the dimensions to the 0.000185 m. f. and found by measurement to be 0.000202. Tempera-

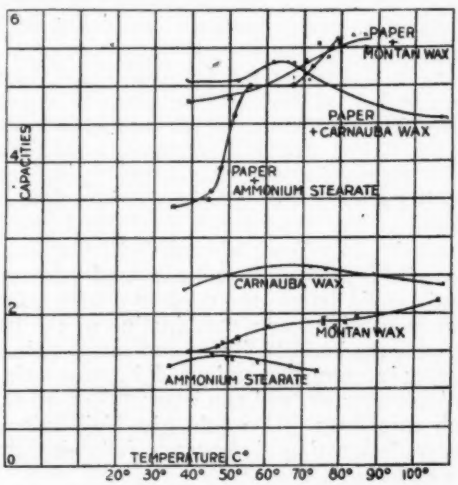


Fig. 2.—Changing Specific Inductive Capacity With Temperature

tures were taken as those of the massive iron container.

In the cases where impregnated paper was measured, three layers 0.0015 in. thick were used. Impregnation changed the thickness of the paper 10 to 35 per cent, depending upon the nature of the substance. This change was measured where possible. In the case of dielectric without paper the thickness of the layer was about 0.01 in., *i. e.*, that of the glass stops.

The curves in Figs. 1 and 2 show the values obtained with varying temperature. The specific inductive capacities of all of the substances tried is much higher in conjunction with the impregnated paper than alone. Most of the materials show a decided change in the neighborhood of the melting point. The two hydrocarbons—paraffin and ceresin—show little change alone; in paper a decided minimum is shown, with a gradual rise beyond the melting point. For the acids and acid derivatives—Carnauba wax, montan wax and ammonium stearate—there is again an appreciable difference between the values for pure substance and substance with paper. The values for pure material are, however, influenced less by temperature changes. In the paper-impregnated samples there is a maximum or a decided hump in the curve.

In general a very decided change in the specific inductive capacities of materials is seen to accompany change of state of materials. The direction of the change seems to bear a definite relation to the composition.

Numbering of Pole Line Structures

Comparison of Various Methods of Numbering Poles—Basis of Nomenclature—Pole Numbering Specifications of Large Power Company

A VARIETY of systems are in use for the numbering of poles of distribution and transmission lines. Some scheme of numbering is desirable for the proper identification of poles, since by this means the issuance and execution of orders is expedited.

The simplest system in use is that involving serial numbers—that is, each pole as set is given the next vacant number of a series regardless of location or size. A modification of this scheme is the division of the territory into districts, each district being assigned a distinctive letter; the letters being used either as a suffix or prefix, as for instance: Pole No. M651 or 651M. Again, each district may be numbered, the district being indicated by the first significant figure of the pole number, as for instance, 8643 or 86435. In each example a pole in the eighth district is indicated; where four figure numbers are used, a maximum of 999 poles is provided for; the larger figure provides for 9999 in each district. Obviously, four figure numbers should be used for the sake of simplicity, if the smaller maximum will not be exceeded. Various modifications of this system have been used with success. Frequently suffix letters are used to denote pole ownership or pole height, or a combination of the two, as, for instance, the letter "Q" may indicate a pole owned by the supply company and used by a certain communication company, and the letter "D" a 40-ft. pole, in which case 8643 QD would give full information (the letter designating size always following that denoting ownership).

Some companies number the poles of transmission lines serially, and in specifying any individual pole, prefix the number or other designation of the transmission line, as, for instance, 86-298 would be the 298th pole on the transmission line, known as No. 86. This system is, however, open to the objection that complications are introduced when branches and tie lines are erected.

Comparison of Numbering Methods.

The difficulty with any system of numbering by districts is that the number gives only an approximate indication of the pole location, whereas other systems, such as those which depend on house or block numbers, will give a more specific indication. Street numbering ordinances usually assign to each frontage certain numbers, so that there is no difficulty in applying such numbering systems to poles regardless of whether or not districts are built up. With 600-ft. blocks, which are the longest ordinarily met with, one number will be assigned to each 12 (or 12½) ft., and a pole thus located by street number may be quite closely placed without reference to a map.

Modifications of this system in successful use are as follows: "253 State" means, with one company, the third pole in the 2500 block on State Street. Another system goes even farther: "25-161 State" specifies a pole in the 2500 block on State Street, 161 ft. north of the south property line. Another system utilizes numbers of the following form: "25SG161 State," which is similar to the last, with the addition of the

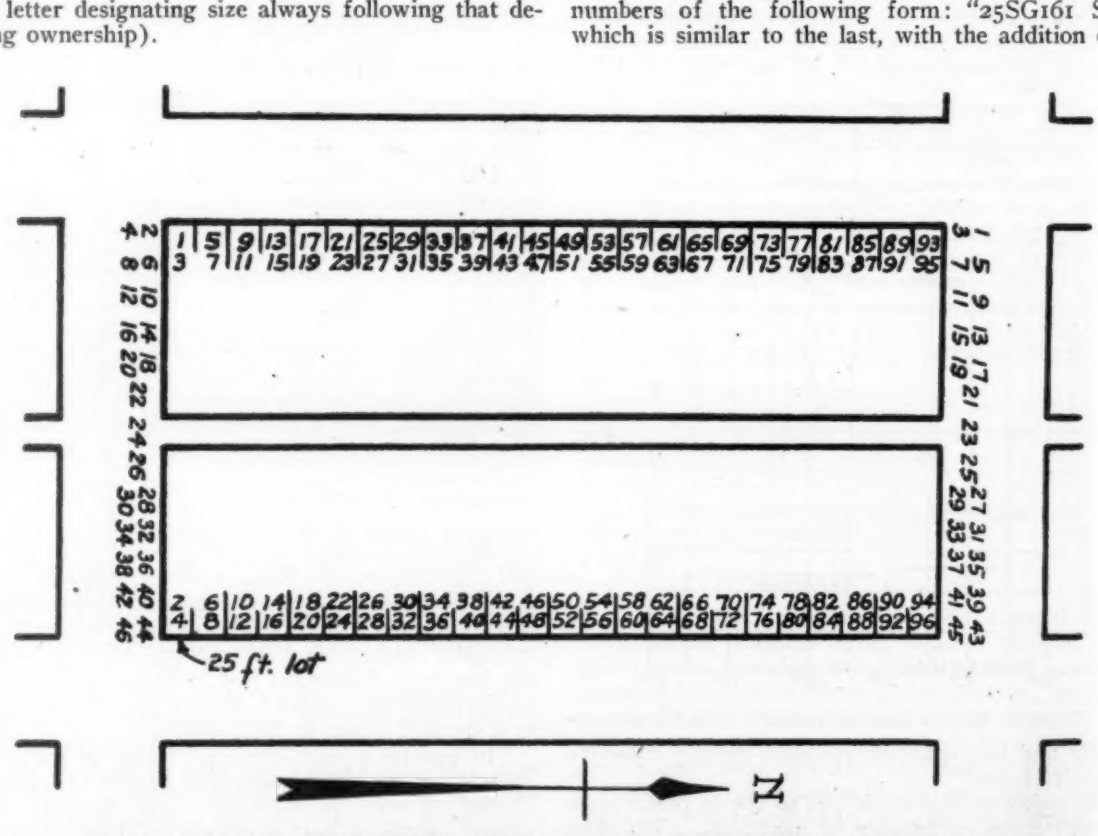


Fig. 1.—Typical City Block, 600x300 ft., Showing Method of Assigning House Numbers to Lots.

letters "SG," which, by a pre-arranged code, give full information as to the ownership and size of the pole in question.

Obviously, the details of a pole numbering system as worked out will depend in each case on the specific

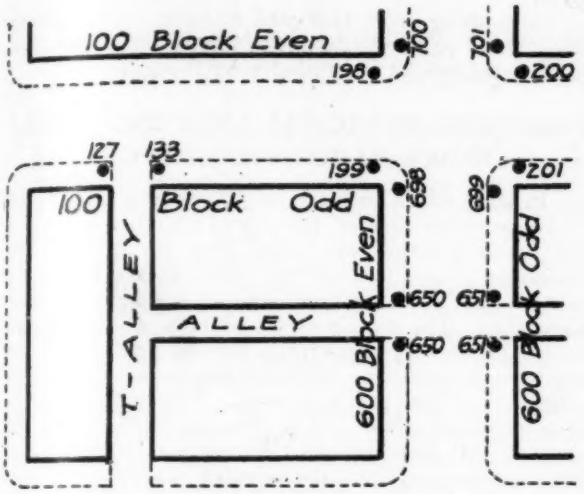


Fig. 2.—Methods of Numbering Poles at Corners.

result desired and the character of the territory served. In placing any system into operation, many minor difficulties will arise, upon the adjustment of which will depend to a large extent the success of the system. In order to show how such systems may be handled, the detailed specifications used by one company are given in full.

This company operates both urban and suburban lines in a territory exceeding 1500 square miles. About 25,000 poles are now installed. After due consideration, it was decided to adopt the street number system for poles in the urban center, while in the outlying territory the district and serial number scheme is used. Specifications for the guidance of inspectors, foremen and other employes are as follows:

Pole-Numbering Specifications.

House Number Basis—Municipal District—In this system, each pole is assigned a number similar to that of the building in front of which it stands. If no building has been erected on a lot, the pole is given a number corresponding to the frontage in accordance with the municipal numbering system. (An example of one of the several block types is given in Fig. 1.) The numbering tag affixed to the pole carries no street designation; that is, the pole in front of 2506 Market Street shall be numbered simply 2506, but in referring to this pole on orders, reports, etc., it should always be specified as pole number "2506 Market."

Corner Poles.—Corner poles at street intersections shall be numbered -98, -99, -00 or -01, regardless of the numbers of adjacent buildings. (Fig. 2.) Any pole within 10 ft. of a corner property line shall be considered a corner pole. Corner poles at alleys are numbered with reference to the street, not the alley; that is, they are considered as being on the street. If the alley divides the block equally, the poles are numbered -50 or -51, regardless of which side of the alley they may be on.

Alley or Back Lot Poles.—Poles in alleys take the numbers and names of street to which the alley is parallel and to which the pole is nearest (Fig. 3), and in addition the letter "A" is prefixed to the number. Back lot line poles are numbered similarly to alley poles except that the prefix "B" is used. Back lot poles always take the name of the street to the west or south. Poles on private property are given numbers based on the lots on which they stand, using the prefix "C."

Choice of Numbers.—If a pole is on a property line it shall take the number of the nearest building; if the pole is equidistant from two buildings, the number taken should be that of the house to the south or west.

Joint or Foreign Poles.—Poles jointly used by this and other companies, whether rights have been purchased or whether used by either company without charge, shall be numbered with prefixed letter as indicated in the following schedule:

Company.	Owned by our company.	Owned by foreign company.
Western Central Telephone Co.	T	JT
Southern Home Telephone Co.	H	JH
Sunset Electric Railway Co...	S	JS
A. B. & C. Ry. Co.....	R	JR
Western Postal Telegraph Co.	W	JW
Happy Valley Land Co.....	V	JV

If three or more companies use a pole the prefixes for both foreign companies shall appear. Example: "TS621 Maple," indicates a pole owned by our company in which companies "T" and "S" have joint use. However, if the pole is foreign owned, then only the initial of the owner appears in number and not the initial of any third party. The prefix letters "A," "B"

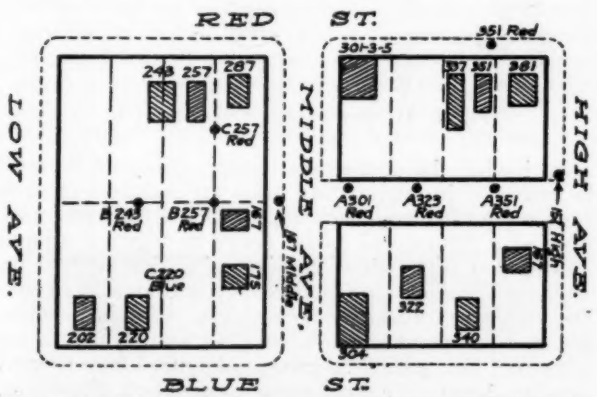


Fig. 3.—Methods of Numbering Poles in Alleys and on Private Property.

and "C" indicating special locations, always follow the prefix letters indicating joint use, as "TA316 State."

Suffix Letters.—Suffix letters are not to be used in this system, as such letters may be confused with streets designated by letters.

Stubs.—Stubs are not numbered unless current-carrying wires are attached thereto. Street light span poles shall be numbered.

Serial Number Basis.—Poles in the serial number districts are numbered serially without regard to location, the next vacant number being assigned to each job consecutively. In the serial number districts the first two or three figures indicate the district number (which likewise indicates the main feeder number of that district). The last three figures indicate the serial number of the pole for that district. Thus "71461" is the 461st pole in district No. 71. (A map showing district boundaries is here attached for the benefit of employes.)

The actual numbering of poles is best accomplished

by means of metal plates, although painted or burned-in letters are also much used. Galvanized sheet iron plates are used by many companies because of low first cost. Aluminum plates have been employed with varying degrees of success; in districts where salt fogs or fumes from industrial plants are prevalent, these last but a short time, particularly a certain quality of plate which appears to stratify and flake off. On the whole, zinc seems to offer the best solution for small plates and galvanized iron for large.

The company utilizing the above described numbering system marks poles as follows: On each pole is placed a company ownership plate at a height of 6½ ft. above the ground line. This consists of a 24-gauge zinc plate (aluminum was formerly used), 1½ in. by

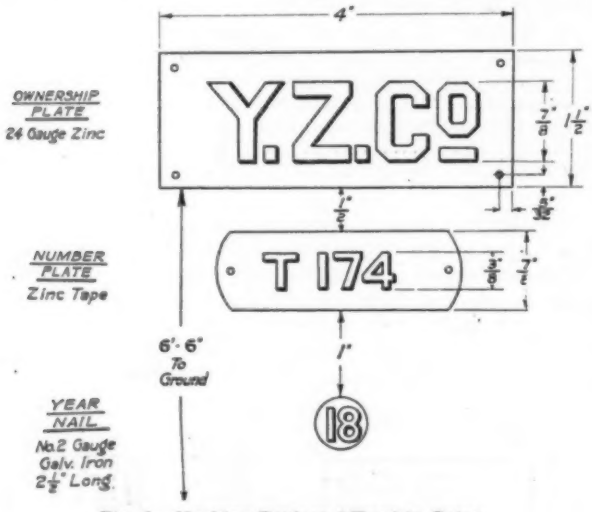


Fig. 4.—Marking Devices Affixed to Poles.

4 in. having the company's initials embossed thereon in letters ⅞ in. high. Nail holes are punched in each corner 5/32 in. from each edge. Below the ownership plate at a distance of ½ in. (edge to edge) is affixed the number plate which consists of a zinc tape ⅞ in. wide with the number stamped by a Roover's embossing machine in letters ⅜ in. high. One inch below the number plate is placed a year nail, which is an embossed No. 2 B. & S. gauge galvanized iron tie nail 2½ in. long. The complete designation therefore, includes ownership, number and date. Plates are attached to poles with 3-d galvanized wire nails.

Certain precautions are necessary in affixing marking devices to poles. Care must be taken to level and center name and number plates and not to mar them when driving in nails. All marking devices are placed on the street side of each pole so that they may be read by inspectors in machines.

Where a foreign company uses independent marking devices, the owning company should place its devices above those of the lessee. Instructions should be issued to employes not to erase or mar the foreign company's stencilling or marking; many employes seem to believe that only the owning company has a right to mark a pole and when they find a foreign company's mark on a pole owned by their company are liable to obliterate it.

Year nails should be placed on all poles whether new or second-hand, when set, the year nail indicating the age of the lead rather than the age of the particular pole. In replacing old poles with new, the old number plates should be destroyed as they cannot be transferred without injury. In removing plates from poles, the nails should likewise be carefully removed. As is well known, a nail or tack in a pole constitutes a serious hazard to linemen, as to strike one with a climber spur may result in a fall. With the plates in standard position, however, the linemen soon become accustomed to their presence and rarely or never strike them.

In painting poles it is well to paint over marking devices, but paint should not be allowed to accumulate in the indentations and thus render them illegible.

PASADENA MUNICIPAL LIGHTING WORKS SHOWS FAVORABLE REPORT.

In spite of an increase of 55 per cent in the cost of fuel and the further increase of all other materials, the report for the year ended June 30, 1918, of the Pasadena (Calif.) Municipal Lighting Works, as reported by C. W. Koiner, general manager, is very favorable. The total number of meters in operation is 10,340, an increase of 723 for the year, while the total energy sold was 6,836,416 kw.-h., an increase of 1.87% over the previous year. The gross receipts also increased 2.88%. This was accomplished in the face of the increased cost of wiring materials and keen competition from the privately owned rival plant of the Southern California Edison Co. During the year negotiations were started with a view of purchasing the distribution system of this company. An agreement has been reached whereby the city of Pasadena will take over, under lease, this distributing system and operate it for two years or until four months after the war when the proposition of purchasing it will be voted on by the people. This contract is now waiting the approval of the Railroad Commission of California. In the meantime further negotiations have been completed for the purchase of power from the Aqueduct Power Bureau of Los Angeles. This agreement has already been put into effect.

In closing the report, Mr. Koiner makes a special appeal for a better salesroom for electric appliances, where proper demonstration can be given to the modern electrical devices. The value of such a room as a convenience to customers in purchasing appliances and further as an advertisement for the company is very well brought out.

ELECTRIC PUMPING FOR LAND RECLAMATION.

The Peninsular Industrial Co., a subsidiary of the Union Meat Co., Portland, Ore., is installing pumping equipment for reclaiming overflow land lying between the Willamette and Columbia Rivers, and now protected by earthen dikes. The equipment consists of a Platt Iron Works 20-in., centrifugal pump, of 10,000 gals capacity, direct connected to a General Electric 100-hp. motor, to operate at 2200 volts, 720 rpm., against a head varying from 15 to 20 ft. The equipment was furnished by Gordon & Finkbeiner, Portland.

CINDERS USED FOR FUEL.

Municipal salvage of cinders is under investigation in Great Britain by the National Salvage Council. It has been estimated by this council that the equivalent of 2,000,000 tons (long tons, 2240 lb. to the ton) of coal is being wasted annually through the non-use of cinders.

Powdered Coal Substituted for Fuel Oil at Seattle

Puget Sound Traction, Light & Power Company Completes Installation in Central Heating Plant — System Electrically Operated

THE Western Avenue central heating plant of the Puget Sound Traction, Light & Power Co., Seattle, Wash., has undergone important changes within the last year, by which effective fuel conservation and economy have been attained. This has been accomplished by re-equipping the 10 B. & W. boilers, having a combined capacity of 4100 hp., so as to use powdered coal instead of fuel oil. This plant, which formerly required 150,000 bbls. of oil per annum, began operations in September, this year, exclusively as a consumer of powdered coal, which consists of bituminous fines and low-grade lignites from the mines of Western Washington, heretofore considered unsuitable for steam plants. Large tonnages of this kind of material, previously classed as refuse, are piled up at the mine dumps. By thorough experimentation it has been demonstrated that this low-grade product, when powdered to a fineness of 100 to 200 mesh, becomes an effective fuel for boilers when fed under pressure through burners which provide the necessary aeration. The disuse of high-priced oil, almost unattainable by reason of the demands exceeding the supply, and the substitution therefor of low-grade bituminous coal and lignite, which are available in sufficient quantity at comparatively low cost, is a transaction that speaks for itself as an economic problem.

New Plant Equipment.

The change referred to not only involved alterations in the boilers of this steam-heating plant, but required the building and equipment of an electrically-operated coal-handling and pulverizing plant on the premises, for which there is a connected alternating-current load of 450 hp. The pulverizing equipment is installed in a new reinforced-concrete building which adjoins on the south the building occupied by the central heating plant, the combined structure facing Western Avenue on the east. On the opposite side of this avenue are raw coal bunkers of 500 tons capacity. The coal from the mines is brought in the company's own cars and delivered by gravity to the bunkers. From the bunkers it is fed by gravity through gates in hopper bottoms to a Stephens-Adamson belt conveyor, 85 ft. long, running longitudinally with and beneath the bunkers. This conveyor, which is operated at a speed of 250 ft. per minute by a General Electric 10-hp., 3-phase, 60-cycle, 440-volt induction motor, delivers the raw coal to a roll-type crusher by which it is reduced to 1-in. size and less. The crushed coal is discharged thence to a 91-ft. belt conveyor, operating in a tunnel that passes under the avenue from the bunkers to the pulverizing plant. This conveyor has a length of 91 ft., travels at an inclination, making a lift of 8 ft. at the discharge end. It has a carrying capacity of 75 tons per hour, and is operated through belt connection by a 15-hp. induction motor. The coal discharged from this conveyor is carried 76 ft. to the top of the mill by a Stephens-Adamson 2-strand chain-bucket elevator and distributed by flight conveyor to crushed-coal bunkers of 300 tons capacity. This elevator travels at a speed of 150 ft. per minute, has a capacity of 78 tons per hour, and is operated by a 15-hp. motor.

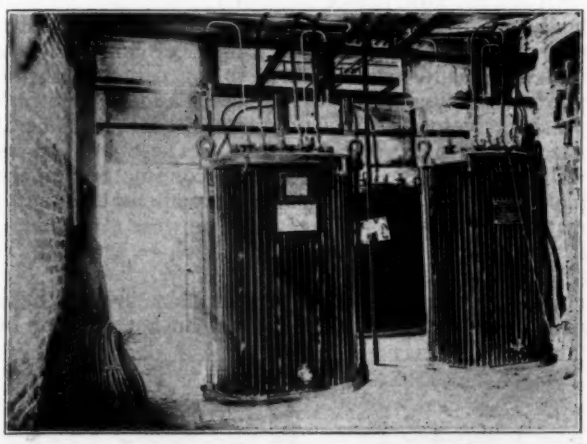
The next step is to pass the coal from the last-named bunkers to two Fuller driers. It is discharged from the bunkers through hopper gates to apron-type feeders, thence through chutes to the driers. Screw conveyors, each operated by an Allis-Chalmers 15-hp. motor, are utilized for delivering the coal from the apron feeders to the chutes.

Operation of the Driers.

The driers consist of two steel cylinders, each 55 ft. long, one having a diameter of 5 ft. and the other a diameter of 6 ft. They are set at a slight inclination from the horizontal to facilitate the movement of the coal toward the discharge ends as the cylinders rotate at a speed of 3 r. p. m. The raising and dropping of the coal within the rotating driers, to hasten the drying process, are provided for by steel baffles placed longitudinally on the interior surfaces. Each drier is operated by an Allis-Chalmers 15-hp., 440-volt, induction motor, wound-rotor type, connected by reduction gears, with external resistance for starting duty. The furnace for supplying heat at about 400 deg. F. for each drier is fired by powdered coal combustion.

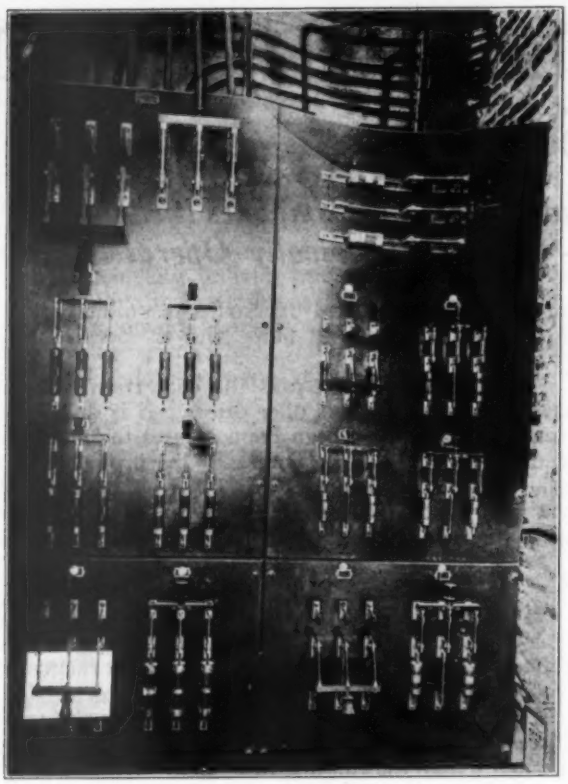
Elevator for Dry Coal.

The dry coal is discharged from the driers into



Two 150-Kv-a. Transformers, Powdered Coal Plant, Seattle.

chutes which lead to the boot of a bucket elevator by which it is carried vertically 61 ft. at a speed of 275 ft. per minute, discharging at the top of the building through a screw conveyor into dry coal bunkers of 150 tons capacity. This elevator, having a capacity of 25 tons per hour, is operated by a General Electric 10-hp. induction motor, at 440 volts and speed of 1165 revolutions. The screw conveyor referred to is driven by a General Electric 5-hp. motor. Reverting to the passage of dry coal from the driers through chutes to



Main Switchboard, Powdered Coal Plant, Puget Sound Traction Co., Seattle.

the last-named elevator, it should be said that these chutes are equipped with 12-in. magnetic separators for taking up any small pieces of iron that may come through with the coal. These magnets operate at 125 volts, direct current.

Electric-Driven Pulverizers.

The coal now passes by gravity from the dry-coal bunkers through chutes to 4 Fuller pulverizing mills, each having the capacity of 5 tons per hour. These mills reduce to extreme fineness, 95 per cent of the product passing a 100-mesh screen and 85 per cent passing 200-mesh. Each mill is belted to a General Electric 75-hp. induction motor. These motors, as well as all other standard induction motors in the plant, are equipped with starting compensators, automatic relays and no-voltage release.

Distribution of Fuel to Boilers.

The product of the Fuller mills is moved by a motor-driven screw conveyor to a bucket elevator by which it is carried 69 ft. vertically to the roof and distributed by a motor-operated screw conveyor to steel bins in the upper part of boiler plant. There is one bin of 15 tons capacity for each boiler. The bucket elevator last mentioned is operated by a 10-hp. motor.

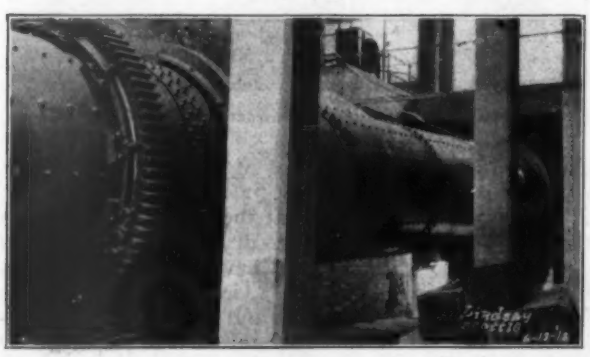
Types of Coal Burners.

All pulverized coal bunkers are equipped with hopper bottoms and gates through which the fuel passes to screw-conveyor feeders, the latter supplying it to the burners. Each feeder is geared to a 1½-hp. Crocker-Wheeler shunt-wound, variable-speed motor, with a range of speed from 500 to 1500 r. p. m. Three types of burners are being used with the view of determining their relative efficiencies. One of them is that designed by W. J. Santmyer, advisory steam engineer for the company; another type is that developed by the Stone & Webster Engineering Division, the third type being that of the Locomotive Pulverized Fuel Co. The differences in these burners consist of the different ways of securing a proper mixture of powdered coal with air and to deliver it into the furnace at the requisite pressure. The coal, in passing from the feeders to down pipes, is under air pressure, and for the Santmyer burner the aeration is brought about before the powdered coal enters the burner. Air for mixing with the fuel, or for carburetion, is supplied by two turbine-driven fans, having a capacity of 50,000 cu. ft. per minute, and at a pressure of about 2 ounces; this air is delivered to the burners from receivers along the firing aisle.

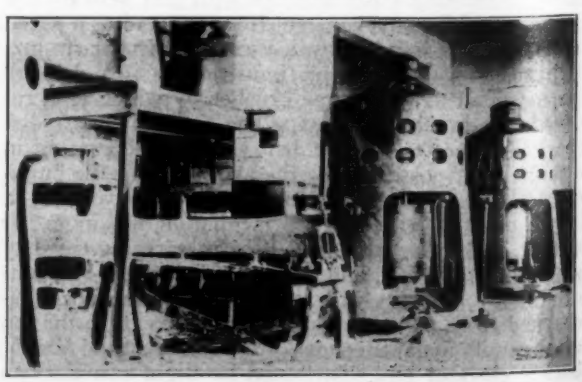
Feeder Cable and Transformers.

The electric energy required for operating this coal-handling and pulverizing plant is received from the company's Union Street substation through a 2300-volt feeder cable, connected to Union station busses by disconnecting switches and a Condit remote-control electrically operated oil switch. This cable is laid underground in fiber conduit to the transformer room at the pulverizing plant, where there are two banks of transformers, 150 kv-a. each, by which the power is stepped down from 2300 to 440 volts, the latter voltage being used for all feeder circuits. The main feeder consists of 4-conductor, 1/0 B. & S. 3/32 by 3/32-in. V. C. L. cable, supplied by the Standard Underground Cable Co. The building is illuminated by 60 and 100-watt lamps, having B. E. D. reflectors. All wiring below grade (—1 mean sea level), consists of lead cable, 5/64 by 1/64 V. C. L., in fiber conduit; wiring above grade consists of 600-volt, N. E. C. standard wire in galvanized-iron conduit. Two slate switchboards, with open knife-blade switches, were installed in the transformer room.

An important fact concerning the construction of



Motor-Driven Cylindrical Drier in Powdered Coal Plant, Puget Sound Traction Co., Seattle.



Two 75-Hp. Vertical Motors Driving Pulverizing Mills.

this pulverizing plant and the replacing of oil burners with powdered-coal burners is that, prior to the adoption of the new plans, an experimental plant, comprising a 300-hp. B. & W. boiler with powdered-coal burner, was operated for a period of three months, during which thorough tests were made with all grades of pulverized coal, under direction of Mr. Santmyer. In these tests it was demonstrated that coal mined in Western Washington, when reduced to powdered form, could be burned under steam boilers more successfully in this form than by any other method, and that the improvement was especially marked in the case of the lower grade coals; that the success in powdered coal as fuel here is found in utilizing the fines of the relatively high grades and of the lignites.

NEW METHOD OF MARKING AND LIGHTING SAFETY ISLANDS.

Steady increase of automobile traffic on important streets and boulevards in large cities and on roads entering such cities has necessitated the erection of what are called "safety islands" to segregate the traffic in the two directions at critical points and in many cases also to afford a safe midway stopping point for pedestrians crossing a wide boulevard or roadway. The importance of a satisfactory safety-island device is very apparent because of the many accidents, oftimes resulting seriously, due to the existing methods of marking and illuminating street crossings, etc.

An outgrowth of the safety work conducted by the

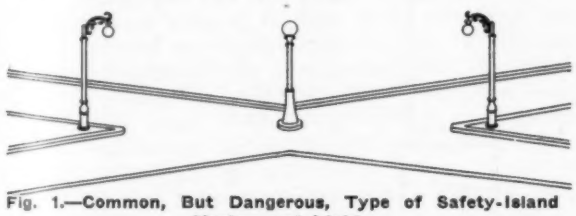


Fig. 1.—Common, But Dangerous, Type of Safety-Island Marker and Light.

Bureau of Mines, Washington, D. C., was an investigation of the construction of safety islands, the outcome of which was a design that is believed to possess marked advantages. The design commonly used consists of a stanchion with a red globe at a height of 6 to 10 or more feet above the roadway (see Fig. 1). This is regarded as an unsafe design because most automobile drivers watch the roadway to prevent collision with, or running over or into, obstructions, objects, ruts, etc., and they do not look up into the air so much, especially at night. Consequently, a poorly lighted or inconspicuous red globe at this considerable height may not be observed until it is too late to avoid collision. This common type of marker has been improved by placing alongside of the stanchion and near the base one or more red lamps of smaller size, preferably in water-tight fixtures, these being in addition to the large red globe at the top.

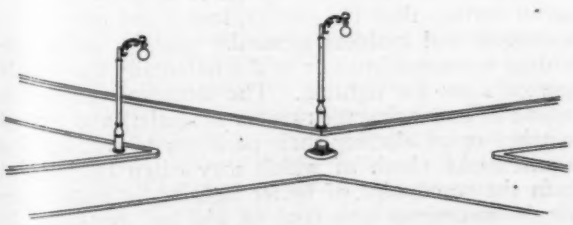


Fig. 2.—New Design of Safety-Island Device Considered Much Safer Than That of Fig. 1.

The improved design developed by the Illuminating Engineering Department of the Bureau of Mines is shown in detail in Fig. 3 and its general location is shown in Fig. 2. The device is designed and constructed to:

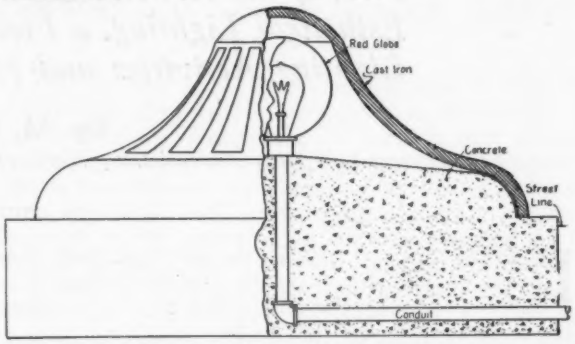


Fig. 3.—Partial Elevation and Section of New Design Developed by Bureau of Mines.

First, mark definitely the intersections of streets, etc., and direction of traffic both day and night, because it is of sufficient size and contour so as to be readily discerned.

Second, to minimize loss of life and serious property damage due to collisions from either careless driving, skidding, or otherwise, for, when properly installed, the top of the casting will be some 12 in. above the street level and therefore of sufficient height to intercede with the average axle of an automobile. Because the casting is seated upon the concrete base in the manner shown, if the impact of a moving vehicle in collision therewith be of sufficient force, the casting will be lifted from its seat and slide forward, minimizing to a very great degree any serious consequences, but at the same time not inviting willful or deliberate attempts to run over it. The question of height, or as to whether or not the above described interference is desirable, is more or less to be decided by the authorities considering the installation. However, it has been found to be desirable, for it helps bring about the respect for traffic rules and laws.

Third, that the device as shown is installed at the proper point and elevation, so as to be always in line of vision both day and night, in the former by its size, color and contour, and last by the light rays coming from the light-source through the vertical slots of the cast-iron housing. Every driver of any vehicle looks upon the roadway for guidance, danger and whatever indications of danger there may be and not in the air for danger signals, as is now the general practice, as for instance, red glowing globes upon high stanchions.

Fig. 3 is a section of the safety-island device herein described, which consists of a concrete base of sufficient size and depth and molded as outlined. From the uppermost center point the surface slopes downward toward the outer circumference, so as to shed water, etc. It contains a conduit, socket, lamp and red globe suitably attached and connected to the lighting circuit. The concrete base should be sufficiently imbedded at the point selected, so that the part of the base marked "street level" will conform with the roadway surface while providing a firm and rigid foundation. The cast-iron cover has its lower part of similar contour to the rounded upper edge of the base, but is somewhat larger so that it fits loosely on the base. The casting has numerous radial slots to permit light from the red globe to be seen when approaching from any direction; this slotted portion may be painted red to attract attention as a danger signal by day.

Linking Science and Art in Lighting

First of Six Articles Showing the Vast Opportunities in Esthetical Lighting, a Field that Covers Half of Normal Lighting Activities and Is as Yet But Little Developed

By M. LUCKIESH

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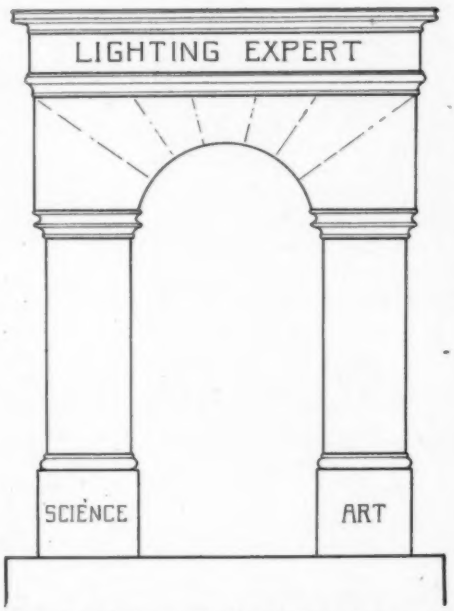
Introduction.

IN THIS series of articles the aim is to treat those fields of lighting in which the psychological, or more specifically, the esthetical aspect is prominent. These fields were the first to be entered by artificial light and for years were the backbone of the electrical industry. They still contribute prominently to this industry, but they are perhaps the least developed of all lighting fields as viewed from the standpoint of the potentiality of lighting. The elements which enter into this class of lighting problems are more numerous and more widely separated in character than those which are found in the more purely utilitarian fields of lighting, for to the scientific and technical phases common to all classes of lighting problems are added the more elusive aspects which depend for their correct treatment and correlation upon an artistic sensibility and a knowledge of the psychological effects of light, shade and color.



Two Foundations of Equal Importance on Which the Lighting Expert Builds.

The fields of lighting in which the esthetical element is dominant or prominent comprise roughly about one-half of all lighting activities in normal times and hence are worthy of more careful attention and of more definite development. In order to develop these fields the consumer must be awakened to the possibilities of lighting and made to realize that artificial lighting is not merely a necessary evil but is one of the most potent agencies available for increasing the pleasure of living. Commercial intercourse is so complex that this awakening of the consumer to a proper interest in lighting cannot be accomplished by any specific group of men, but can result only through a more concerted action of various groups who must realize first that each is a factor in this development. It is the aim of these articles to point out a few of the factors upon which this development depends.

The largest field in which the esthetical aspect dominates is residential l i g h t i n g, although from the standpoint of lighting, many clubs, hotels, restaurants and other interiors are closely akin to residences. In high-class stores and many other places of business the esthetical aspect is important and in certain offices and even in street lighting this aspect is not negligible. Therefore, it is seen that an artistic sensibility is an important requisite in the development of certain fileds of lighting and must go hand in hand with scientific or technical knowledge. In other words, lighting calls forth the extremes of man's accomplishments and, as intimacies of scientific skill and artistic sensibility are rare and almost unnatural, it is not strange that the art of lighting, after a score of years of attention, is still in the primary stage of its development. Much progress has been made in recent years but the beginning is still in sight though the goal is far ahead hidden in the obscurity of our still uncertain and incomplete knowledge of the subject and its many angles of possible and highly fruitful development.

One of the goals of the lighting industry on the return of normal conditions should be to awaken the interest of this very large class of consumers in these broader possibilities. If this is done, the result is bound to be profitable to all concerned.

Part I.—A Broad View of Lighting.

In a broad sense, lighting and vision are synonymous, therefore lighting is not merely a matter of outlets, lamps and accessories, but should be adjudged from the standpoint of effect. Unfortunately this is not generally done and it is a common error to focus the attention upon the appearance of the fixture instead of upon the result—the illumination on the various areas or objects or on the room as a whole. It is not unusual for architects, decorators and even fixture-dealers to consider only the appearance of fixtures when unlighted.

Engineers not uncommonly err in considering lighting no further than the outlets, lamps and equipment. Architects and builders generally specify outlets according to convenience or to the habitually inadequate appropriation for lighting. The electrical contractor, instead of increasing the number of outlets and control switches or of altering their positions to suit lighting requirements (both of which may often be justified from the standpoint of better lighting in many interiors), sometimes attempts to aid his customer by recommending certain curtailments under the delusion

that he is serving his client well. In fact, too often such saving is accomplished at the expense of satisfactory lighting with the result that the consumer has eventually suffered rather than benefited.

The fixture-dealer displays and sells fixtures too often without a knowledge of the important details of the rooms (especially the decorative schemes) in which the units are to be installed. Furthermore, very few fixture-dealers demonstrate lighting effects in a room; they merely display fixtures. Seldom do they visualize the lighting effects desired or in considering their part in the work do they visualize the lighting problem as a whole.

There are still more links in the chain of evolution of a lighting installation than have been indicated in the foregoing, for besides the architect, the builder, the electrical contractor and the fixture-dealer, there are several others whose activities are closely associated with the lighting result. Besides the ultimate consumer, whose ideas should be considered and whose taste should be guided, the lamp dealer, the central-station representative and the decorator can play their parts. But if each is to do his part well he must have a grasp of the general problem and the desired result. But this is not generally the case today for there is little co-ordination of these various aspects and each individual ordinarily views little more than his especial work.

Co-ordination of All Interested in Esthetical Lighting Necessary for Proper Development.

The development of lighting in the classes of interiors under discussion and the awakening of the consumer to the importance and possibilities of lighting cannot be fully realized until those who now work independently co-ordinate their efforts toward a common goal—the desired result. An analogous case is the decorating and furnishing of a home. If this be done by an individual of artistic sensibility and imaginative ability, the final result is one of completeness with no misfits, and one in which the law of appropriateness is fully exemplified. But if the decorating and furnishing of a home are done without this ability to sense and to visualize the esthetic aspects and fitness of wall coverings, draperies, furniture, fixtures, etc., individually and combined, the result is likely to be a conglomeration of misfits. No one would disagree with this statement pertaining to home furnishing, but through lack of knowledge, relatively few persons realize that the same law of appropriateness holds for the various elements which comprise a lighting effect.

This condition would be eradicated if a lighting expert could be employed to take charge of all the factors which enter into the final lighting installation and to guard against handicaps and obstacles which often arise from viewing too narrowly such elements as wiring, construction and decoration. But it is out of the question to employ such experts for superintending the work for a large majority of the homes and other interiors and hence this piecemeal method, or rather, lack of method, prevails. Therefore, if lighting is to be developed properly, certain responsibilities must be recognized by those upon whom the consumer is dependent for specifications and advice.

Let us review a few of these responsibilities. In those cases where an architect is employed for furnishing plans and specifications there would be general satisfaction if he were as thoroughly cognizant of the possibilities of lighting as he is of construction. But generally he is not. Furthermore, we should not overlook the fact that thousands of homes are constructed by the so-called builder who is thoroughly capable of building but incompetent in dealing with wiring, decoration and lighting.

Scarcity of Outlets and Switches a Serious Common Fault.

One of the most conspicuous faults of lighting installations, especially in residences, is the scarcity of outlets and the meagerness of circuits and control switches. It is obvious that the possibilities in lighting effects are seriously curtailed if only one or two circuits and outlets are provided in a room. Furthermore, it is not encouraging for the householder to attempt to avail himself of the pleasure which would be gained by using several portable lamps (combining both beauty and utility if desired) if only one base receptacle is present in the living room. In the bedchambers the delightful effect and usefulness of a small portable cannot be enjoyed unless an outlet is available. And so on throughout the home numerous outlets are needed if the attractiveness and convenience of adequate and appropriate lighting is to be available. Some of these outlets could often be conveniently located for the vacuum cleaner, electric heater, fan, and other electrical apparatus.

The cost of a few extra outlets is such a small part of the cost of a residence and their value is relatively so great in comparison with their cost that their absence or scarcity in the homes of the middle class cannot be successfully justified on the basis of cost. But notwithstanding these facts, base receptacles are far too rare in the home. We need not search far for confirmation of these statements. Across the street a $15,000 residence is just being completed. Although the writer has made many excursions of this character, it was of interest at this point to ascertain the number of base receptacles provided in this residence. Two were found in the large living room, none in the dining room, none in the chambers, none in the kitchen, and none was discovered in any other room in the house. Contrast this with a residence costing one-half as much but which was built by a person who recognized the importance and value of lighting. Besides adequate bracket and ceiling circuits the following baseboard receptacles were installed: Six in the living room (about 14 by 25 feet), two in the dining room, two in the den, one in the upper hall, one in each bed chamber. Besides these, there were receptacles on the mantel shelf and over built-in bookcases. All these outlets are used and in two or three instances two units are supplied from a single receptacle.

Somewhat the same discussion applies to circuits and switches. During the construction of a residence the cost of running circuits to the center of the ceiling is comparatively negligible and should often be done even though central ceiling fixtures may not be installed initially. In order to enjoy a variety of effects from a single fixture for a small living room or over a dining table at least two or three separate circuits are necessary, and incidentally variety is the keynote to satisfactory lighting in interiors. Until it is made possible to enjoy this feature by adequate wiring, lighting will not develop to the extent of its possibilities, for by providing variety, the consumer's interest is awakened and this must be done before esthetical lighting is properly stimulated.

Although the design and sale of lighting fixtures will be treated in a later article, too much emphasis cannot be applied to these aspects. The average house-

holder, as well as many other consumers, is almost wholly dependent upon the fixture-dealer for advice pertaining to this aspect. Good advice, founded upon a thorough knowledge of the important conditions in a particular case upon which satisfactory and appropriate lighting results depend, is not generally available. Furthermore, fixture-dealers rarely demonstrate lighting effects for they are usually equipped only to display fixtures. As a consequence, fixtures are generally sold as things apart from lighting. Of course, a fixture should be artistic, but to display only this aspect inhibits the development of lighting, for thousands of these opportunities for awakening the consumer's interest in lighting are lost yearly. It is interesting to confirm these conclusions by visiting fixture stores as a prospective purchaser of fixtures for the home. In discussing this situation it has been borne in mind that there are exceptions to this general condition, but their number is pitiably small.

Proper Relation of Efficiency in Esthetical Lighting.

In this article, wherein the aim is to give a general view of factors upon which esthetical lighting is dependent for development, space does not permit more than brief considerations of some of the more important phases. One aspect which is much misunderstood and overemphasized is that of efficiency. There is no excuse for wasting light; but what constitutes waste of light or inefficient lighting? Light should be produced as efficiently as possible at the source and the lighting accessories should direct and diffuse the light without waste. But the highest efficiency in esthetical lighting is not represented by the cheapest lighting. Efficiency in this field of lighting is not measured in terms of cost alone and it should not be so measured in any field. Efficiency in lighting is a measure of how well the installation fulfills the desired result. In other words, both satisfactoriness and cheapness combined afford the means for determining efficiency in lighting.

Light as it falls on the various areas and as it models various objects is a decorative medium as positive in its effects as pigments in wall coverings, etc., and possesses greater flexibility. This aspect will be treated more fully in the next article and others, but suffice it to state at present, that as a decorative medium capable of making a room pleasant or a home enjoyable its efficiency cannot be measured by its cheapness. Do we inquire the efficiency of a wall covering, of a tapestry or painting, or of the pattern in a rug? It is as ridiculous to think of efficiency in its narrow sense as applicable to esthetical lighting.

We employ silk shades, toned glassware and tinted lamps to obtain delicately tinted light because we enjoy it more than the raw light of modern illuminants, but the cold calculating individual inoculated with the miserly, inartistic inefficiency germ attempts to rob us of this pleasure by reminding us that such procedures waste light. But the fact is, by these means we conserve light and give it some value which for us it did not possess in the raw state. Efficiency is an excellent slogan if not overdone. It has worked wonders in the proper places but the very cold-bloodedness of strict adherence to its narrow meaning is equally disastrous in other cases. So it is with lighting. If the raw, undiffused light is not pleasing to us, we conserve light by absorbing some of it in the filtering process and actually greatly enhance the value of that which remains. A future article will be devoted to this aspect.

By these brief discussions it is hoped that the magnitude and complexity of these fields of lighting have been indicated. In the remaining articles it is the aim to treat these further and to reveal to some degree the potentiality of lighting.

(To be continued.)

MANUFACTURE OF LESS ESSENTIAL HEATING DEVICES STOPPED.

The Conservation Division of the War Industries Board, applying its program of eliminations to conserve essential materials and labor, to free capital tied up unnecessarily in manufacturers' and merchants' stocks, and to simplify factory production, has issued a schedule for manufacturers of electrical heating appliances, which calls for discontinuance of the manufacture of the following electrical utensils and appliances:

Carburetor heaters, handwheel heaters, intake heaters, manifold heaters, primer heaters, blankets, robes, cigar lighters, frying pans, plate warmers, curling irons, sauce pans, waffle irons, fluting irons, egg boilers, soup kettles, stew pans, corn poppers, hand dryers, hosiery forms, peanut roasters, transfer irons, vaporizers, varnish sprayers, entree dishes, cigar lighters for automobiles, book-binding appliances, instantaneous water heaters, automobile foot warmers, fudge warmers, vegetable dishes and all Sheffield plate ware.

The foregoing list, it will be observed, does not contain any of the popular and most used electrical heating appliances, such as flatirons, disk stoves, percolators, toasters, tea urns, ranges, ovens, heat-storage or "fireless" cookers, etc., all of which are recognized as important means of conserving fuel, food and public health. Only those devices that are specialties and are not so widely used are placed temporarily on the debarred list, so that the great scarcity of metals may be reduced and these necessary materials made available for the production of munitions, shipping and other most vital war needs.

DIFFICULTIES IN THE MANUFACTURE OF X-RAY TUBES.

When the German Government declared war and automatically stopped the export of a great number of "Made in Germany" products a chapter was begun in the manufacturing records of the allied nations that reads like a novel. One of the articles the principal manufacture of which was a trade secret of German manufacturers was the X-ray tube. In a recent article in an Australian paper the difficulties encountered in the manufacture and repairing of these tubes both in the days before and during the war by an Australian manufacturer are told. The exhaustion of X-ray tubes requires not only the removal of the air, but also the removal of the last traces of the gases that adhere to the walls of the tubes and the metallic electrodes. After years of experimenting before the war, this manufacturer finally attained a certain degree of success in July, 1914, by using a special type of Sprengal mercury pump. The outbreak of the war created such a demand for repairing these tubes that this equipment was not long satisfactory. By the latter part of 1917, however, they were able to handle the rebuilding of these tubes on a commercial basis but they have not yet undertaken the manufacture of them. The war, however, has brought several English and American factories into the manufacture of these tubes with such success that it has become another branch of export business forever lost to Germany.

New Hydroelectric Plant of Montana Power Company

Continuation of Description of Holter Project — Details of Electrical Generating, Transforming and Switching Equipment

By W. A. SCOTT

IN LAST week's issue the physical features of the Holter project of the Montana Power Co. were described. The construction of the dam, waste gates, penstocks, racks and power house, as well the general features of the hydraulic installation were fully set forth. As stated then, the plant is located on the Missouri River, about 40 miles north of Helena.

Generators and Accessories.

The installations under this head consist of four Westinghouse vertical, revolving field generators, rated at 12,000 kv-a., 6600-volts, 3-phase, 60-cycles, 150-revolutions, 80% power-factor. The order for this and accessory equipment was placed May 9, 1916. Regulation at full speed and under a 12,000-kw. load showed the following:

	Guaranteed.	Shop test.
For 80% P. F.	35%	23.5%
For 100% P. F.	20%	14.0%

When operated at continuous, normal rating it is guaranteed that the temperature by thermometer will not exceed 50 deg. C. rise above the cooling air, and by thermocouple not to exceed 80 rise above cooling air. Nine thermocouples are placed at the hottest points in the armature for use with potentiometer type indicator mounted on switchboard.

Calculated efficiencies show the following:

	100% P. F.		80% P. F.	
	Guaranty.	Shop test.	Guaranty.	Shop test.
Full load	96.8	97.2	96.2	96.3
¾ load	96.4	96.7	95.7	95.7
½ load	95.3	95.5	94.3	94.3

Field rheostats are electrically operated from the 125-volt direct-current bus. They are designed to be

View of High-Tension Floor in Holter Plant of Montana Power Company.

General View of Generator Floor—Holter Plant, Montana Power Co.

able to reduce the voltage on generators to 50% of normal with full load amperes at zero power-factor leading, passing through the armatures, the exciter voltage being 250.

Each generator has one Kingsbury oil-lubricated thrust bearing, carried on a spider having eight heavy cast-iron arms situated above the rotating field. Below the thrust bearing is an oil-lubricated guide bearing 3 ft. in length, and a second similar guide bearing of same length below the rotating field. Eight brake shoes, operated by air pressure from the 80-lb. station air mains, act on the under side of the rotor rim. The ventilation of each generator requires 86 sq. ft. area for the entrance of air; the openings on the pit liner give 126 sq. ft. of area. The fans and blowers are placed at both top and bottom of rotor, the top of generator being completely closed. The armature terminals are on the lower side, and the field sliprings are between the rotor and upper steady bearing.

The exciter sets consist of two direct-current generators with vertical shafts, arranged for direct connection to water wheels. Each generator is a 500-kw., 250-volt, 2000-ampere machine, compound-wound, 8 pole, 150 r.p.m. unit. These are Westinghouse exciters. Each exciter is capable of the necessary excitation of all four main generating units.

Transformers.

The plant contains four 12,000-kv-a., oil-insulated, water-cooled, 3-phase, step-up transformers. The high-voltage winding is 107,000 Y; the low-voltage winding being 6600 delta. The transformers, furnished by Westinghouse Electric & Mfg. Co., are guaranteed to carry a load of 16,000 kv-a. continuously. They are mounted upon structural steel trucks, and are provided with lifting sling for removing coils and iron from the tanks.

Switchboards.

The switchboards, which are Westinghouse, comprise four 20-in. generator panels, one bus sectionalizing panel in the center, 20 ins. wide, mounting totalizing recording wattmeter, and generator temperature indicating apparatus with swinging brackets on end of panel for synchronizing equipment. The line and transformer section consists of five panels, each 20 ins. wide, and one bus sectionalizing panel 20 ins. wide, mounting one graphic recording frequency meter and one graphic recording voltmeter. The auxiliary section comprises one local power circuit panel, 20 ins. wide, one 20-in. storage battery panel, one 20-in. wide exciter panel, and two voltage regulator panels. The light and power section contains six panels, each 2 ft. wide, mounting knife switches for power house and dam lighting and for power circuits.

The above four sections have top panels 65 ins. high and base panels 26, all having a thickness of 2 ins. All are mounted upon 1¼-in. pipe frame and on edge of a structural steel pull-box set in the floor, with top 1 in. above the floor.

The excitation section consists of one exciter panel at each end, carrying exciter positive breaker, nega-

tive and equalizer switches; four generator field switch panels, each carrying one 2-pole electrically operated field switch with bus-tie panel in center.

All positive current breakers are electrically operated; all negative circuit opening devices are knife switches, hand-operated, but normally to be kept closed. All panels are of natural black slate, with instruments finished in dull black.

Conductors.

The general leads consist of two 700,000 cir. mil caple per phase; bus tie, three 900,000 cir. mil cables per phase. These are all for 6600 volts, and have 8/32-in. varnished cambric insulation covered with a double braid of cotton saturated with weatherproof compound. The exciter leads, consisting of two 1,000,000 cir. mil cables, are in parallel for 250 volts, and are insulated with 7/64-in. varnished cambric, covered with a double braid of weatherproof saturated cotton. Generator field lead consists of one 300,000 cir. mil cable, for 250 volts, insulated and covered as specified above. All main leads are carried in fiber conduit, with waterproof joints; all instrument and control wiring is installed in iron conduit. Busbars are of ¼-in. by 3-in. copper bar. Generator leads, 2 bars; transformer leads, 2 bars; bus tie leads, 3 bars; main buses, 2 and 3 bars. The busbars are located in concrete structures.

Two 16-kw. motor-generator sets are provided for energizing the 125-volt control bus, operating circuit breakers and for charging storage batteries.

The lightning arresters installed consist of the aluminum-cell, electrolytic type, of 110,000 volts ungrounded neutral, with tanks grounded; low equivalent, 6600 volts ungrounded circuit.

Oil Piping System.

A central oil lubricating system with single supply and drain mains is installed. The oil, after leaving the bearings, flows to either one, or both, of two sump tanks in the basement, and is pumped thence to a filter and cooler on the fourth floor by a motor-driven centrifugal pump, automatically controlled by balanced valves and floats. After filtration and cooling, the oil passes to two storage tanks, just below the fourth floor, from which it flows by gravity to the bearings. The reservoir capacity is sufficient to supply oil for operating the entire station for 60 minutes with both oil pumps shut down. The lubricant required for the principal bearings amount to 81 g.p.m., the system having been designed for 85 g.p.m. or 5100 g.p.h. The four main-unit thrust bearings require 15 g.p.m. each; the eight main-unit guide bearings, 1 gallon each; the two exciter-unit thrust bearings, 5 g.p.m. each; its six guide bearings ½ g.p.m. each.

Stream Data.

Data on stream flow at the dam site show the following: Minimum, unregulated, 2500 cu. ft. per second; minimum flow, regulated, 3500; normal flow, 4000; average flood, 20,000; estimated maximum flood flow, 80,000; maximum recorded flood flow, 38,000. Plant installation of 48,000 kv-a. requires 6032 cu. ft. per second.

Pondage and storage areas above and including Holter dam are as follows:

	Acre-feet.
Hebgen reservoir	325,000
Madison Lake, at Madison plant	36,000
Lake Sewell, at Canyon Ferry	40,000
Houser Lake	46,000
Lake Holter	60,000

The Holter plant site is in the path of the Great Falls-Morel-Anaconda 110,000-volt, 2-tower line, with which connection is made; and a new 2-pole, 100,000-volt line is being constructed from the Holter plant to East Helena, a distance of 35 miles.

CIVIL SERVICE EXAMINATION FOR ELECTRICAL AND MECHANICAL ENGINEER.

The West Chicago Park Commissioners, Chicago, Ill., are contemplating a combination of their present electrical division and steam heating division into a mechanical and electrical division. A mechanical and electrical engineer will be placed at the head of the new division. This new position will pay about $3300 per year at the start and $3600 per year as soon as the incumbent has fully demonstrated his ability to handle the work. The mechanical and electrical engineer will also be allowed the use of an automobile while on duty.

The entire service of the Park Commissioners is operating under a stringent civil service law which insures permanent tenure to all efficient and competent employes. The appointment to this new position will be given to the person who receives the highest average in a civil-service examination open to men residing anywhere in the United States.

The work of the mechanical and electrical engineer will include responsibility for and supervision of the following: Operation, maintenance and repair of the electric lighting system for over 30 miles of boulevards, and 800 acres of parks, including high-tension transformer substations and transmission lines, and all auxiliary apparatus; also the design, maintenance and repair of illuminating equipment in all park buildings. The preparation of plans and specifications for alterations and new electrical construction work and supervision of their execution will also be included. The operation, maintenance and repair of about 14 low-pressure steam heating plants and 5 high-pressure steam plants, located in the various park and playground buildings throughout the system. The high-pressure plants vary in size from 100 to 1000 hp. These are operated for heating and ventilating park buildings and furnishing steam for park laundries. The engineer will also be responsible for the layout of alterations to present plants and the construction of new heating and ventilating installations.

All persons interested in a position of this character should communicate with A. C. Schrader, superintendent and chief engineer, or with Fred. G. Heuchling, superintendent of employment, West Chicago Park Commissioners, Union Park, Chicago.

LOUISVILLE UTILITY EMPLOYES HELP DRAFT BOARDS.

The employes of the Louisville Gas & Electric Co., Louisville, Ky., contributed their services in making out all of the records in connection with the recent registration for exemption boards Nos. 4 and 5. They also assisted the employes of other concerns in handling the clerical work for boards No. 3 and 6. L. S. Mayer, auditor of the company, supervised the work. There are two other draft boards in the city, to which the Louisville company employes have offered their services for similar work.

Liberty Bonds will free the world of the bonds of kultur.

Editorial Comment

Dollars Over Here Enables Our Boys "Over There" to "Carry On"

LIBERTY BONDS represent guns, ammunition and tanks, food, clothing and bandages, that will vanquish the enemy, hasten our victory, and lessen the suffering and deaths of our men and those of our allies. Can you hesitate in lending your money to such a glorious use? Would you hoard your dollars while others freely offer their lives? There is only one answer for a humanitarian, a patriot, an American. That answer is to buy bonds to the utmost. And do it now.

Remember Chateau-Thierry, Cantigny, St. Mihiel salient and many more. We cannot all take a part on the field of battle. But we can, each one of us, stand behind our fighters with our money. It is a slacker dollar that does not go to pay for victory. We are not asked to give our lives, only to lend our dollars. Our boys do not hesitate as they "go over the top," dilly-dallying as to whether they can or cannot "carry on." They know their duty and they do it. Why, then, should we hold back our dollars, which we are asked only to lend for a little while, while those "over there" offer their lives unflinchingly? Lend your money to victory, lend it generously, ungrudgingly, to the utmost, as so many are giving their lives.

By purchasing bonds each of us can help beat the Kaiser-Krupp-Kultur crowd into submission and subjugation, making the beating the easier, and bringing it about the sooner. Bulgaria is apparently already out of the war, Turkey is on the verge of surrender, and Austria-Hungary is crumbling. Things are going well, but we have a long way yet to go before the war is won, for we are only now reaching the beginning of the end. Let past successes be incentives for harder, more intensive prosecution of the war. A long pull, a strong pull and a pull together, now, and winning of the war will come the sooner. Buy your bonds today.

Liberty bonds are striking the death knell to the "deutschland über alles-mitteleuropa" aims. An oversubscription of the loan answers once and for all the cry for peace upon a *status quo ante* basis. A barrage of bonds will quelch forever the cursed creed borne of Treitschke and Bernhardi that might is right and the end justifies the means. Therefore, buy bonds, lend your money ungrudgingly and to the utmost for the winning of the war. Do your duty and your best in bringing a lasting peace to a weary war-scarred world.

Will you not lend your money, while others give their lives?

Planning for Esthetic Lighting

WAR always has been essentially destructive, but never so much so as during this world upheaval through which we are passing. Every energy must still be bent to insuring a successful end to the violent conflict and to hastening that end, even if it involves development of new agencies of destruction. To the ordinary citizen, therefore, it may seem difficult, if not inopportune, to turn his thoughts to constructive ideas and especially so when these deal with matters so far removed from the sanguinary events of the day as is any development aiming to make life more enjoyable by making our environment richer and more beautiful.

Recent news from the war zones in the Balkans and Palestine as well as in Flanders and France has given an indication of the certain beginning of the decline of power among the enemies of justice and international honor, and in the distant horizon arises a more distinct vision of the better and more beautiful world that is to be. It is becoming our duty, therefore, in the midst of unrelenting destruction of our unscrupulous foes, to give serious thought to reconstruction and even to consider new constructive developments that will be made possible on return of peace.

One of the most promising of such developments to interest electrical men is esthetic lighting. Aside from a few notable instances incorporating something of the spectacular, as in exposition and theater lighting, we have as yet seen but very meager development in this line. The lighting art is still young and, in fact, it is scarcely more than a dozen years that systematic study has been directed to its more intensive evolution. Most startling of its developments in these years has been the scientific improvement of light sources and auxiliary equipment, and scientific study of the laws of lighting and of its requirements. Relatively little attention and thought has been given to the artistic side of lighting, however, as is only too evident when one views the dismal efforts to combine the esthetic and utilitarian aspects of lighting in even some of the better class residences.

The building of residences has not been at such low ebb for many years as it is now and consequently architects, electrical contractors and fixture-dealers, all of whom should be keenly interested in the possibilities of esthetic lighting, have an abundance of time on their hands that may very well be employed in planning for the resumption of active business and developments in new channels.

Such lighting must obey the scientific principles of illumination and also conform to certain well established artistic canons. Very few, indeed, of the men

now connected with the various branches of the lighting industry possess this necessary dual knowledge for effective design of esthetic lighting, and, in fact, the great majority has not even a conception of what such lighting is, much less of its requirements and possibilities. The time is therefore ripe to bring this matter to attention of those that must become interested and to educate them to develop this fertile field that lies ready for intelligent and profitable exploitation.

It is with pleasure, therefore, that we can place before our readers a series of valuable articles covering these various points. It is by Mr. M. Luckiesh, physicist, writer and lecturer, who after long association with the scientific side of lighting research, has devoted the last few years more especially to the study of the artistic side of lighting, and has presented many of his advanced ideas in lectures, papers and books. He has probably done more for effectively co-ordinating science and art in lighting than any other investigator and is the foremost authority on this fascinating subject. The six articles he has written for the ELECTRICAL REVIEW are appropriately entitled, "Linking Science and Art in Lighting."

The first of these articles, which appears on other pages of this issue, includes a general introduction to the subject which shows that about one-half of the lighting field falls within the scope of potential esthetic lighting, this comprising nearly all residence lighting, as well as the lighting of churches, theaters, hotels, restaurants, clubs, etc. The possibilities in this line are so extended as to be beyond the conception of all but a very few that have given serious thought to this subject. Mr. Luckiesh points out how co-ordination of the various interests will be necessary in order to bring about concerted and harmonious results, but before this can be made effective these interests must understand what is the aim to be achieved and what are the pitfalls to be avoided. Many radical changes will have to be made in the former practices of architects, contractors and fixture-dealers.

Mr. Luckiesh's articles will be found to be a revelation to those unfamiliar with what may be done with esthetic lighting and in many cases at comparatively moderate cost. Relief from monotony is becoming more necessary in lighting as in other things. Through variation of the intensity, direction and color of the light it is possible to produce an indefinite variety in illumination effects to suit different occasions and moods. There is no reason why artificial illumination should be so rigidly unchangeable as is usual when there is but one outlet. Daylight is quite variable and through its changes often more agreeable. Artificial lighting in very many cases can also be made varied and therefore more pleasing. After years of slaughter on the battlefields and on the seas and almost unlimited destruction of all that is dear to the human heart, let us on the return of peace be prepared to increase the joy of living by brightening up our homes and through the development of the beautiful help to stimulate the progress of civilization.

Putting One's House In Order

THE TIME to prepare against the onset of winter is now. Just as the Indians of old laid away their stores for the winter, so should plants now lay up their spare parts and satisfy their requirements so as to be self-supporting during the months when the railroads may and probably will be unable to bring equipment to them.

For the power plants' preparedness means preparation for fuel difficulties, overloads, labor and operating troubles and cold weather. Just as a battleship clears for action before going into battle, so must every boiler room and power plant now clear out old inefficient apparatus and ways, dispense with ignorance and chance, and eliminate laxity or be too late for the coming of the long, hard fight against cold and snow and wind, overloads and labor troubles that the winter may have in store. It is a matter of preparing not against the inevitable, but against the probable. And in any case such foresight and preparedness will save money, much anxiety and trouble, if nothing else. To be prepared is to be spared. It is well worth while.

The engineer or executive that does these things will benefit not his organization and himself alone, but the country. There is a moral obligation to the nation as well as a financial obligation to one's organization to do these things.

George Henderson, the fuel administrator's engineer for the eastern district of Pennsylvania, at a recent meeting in Chicago of the Fuel Conservation Section of the United States Railroad Administration, stated that his department in seeking to rate the efficiency of power plants, considers as important factors determining the rating, the effectiveness and regularity of flue cleaning, the extent to which CO_2 determinations are made, the utilization of exhaust steam, the extent to which boilers and steam lines are insulated, and the degree and quality of supervision exercised. These are, every one, matters that can be carried out without any radical change in a plant, without interfering with operation, and without excessive outlay.

To put the power plant in order, and there is perhaps greater scope for improvement in the boiler room than elsewhere, is a thing every power-plant operator should do as an act of patriotism alone. And there is the financial reason, sufficient incentive in itself. The cost of bituminous coal has gone up in price about 250 per cent since 1915, and the above improvements and practices were money-saving practices then.

"Put your house in order" is advice as timely as it is wise. Do what you can to improve combustion, increase evaporation and reduce waste by the use of care and instruments, by keeping heating surfaces clean and covering boiler and steam and hot-water lines. And not least, keep an ever-watchful eye on plant performance. To do these things, while waiting for new apparatus and radical plant improvements, will benefit alike the pocketbook and the country as a whole.

Week's Events

Industrial Education Section Established—Oregon Contractors Meet—Gear Manufactors Discuss War Problems

NEW ENGLAND CENTRAL-STATION MEN HOLD CONVENTION.

Many Important Topics Discussed at Tenth Annual Convention Held at Springfield, Mass., Sept. 27 and 28.

The tenth annual convention of the New England Section of the National Electric Light Association opened its first session Friday morning, Sept. 27, at the Hotel Kimball, Springfield, Mass., with an address by President A. B. Lisle, of the Narragansett Electric Lighting Co., Providence, R. I. This was followed by reports of the treasurer and the secretary. The secretary's report bore evidence of the great progress made by the section during the past year, and showed a total membership of 952, of which number 54 members are enlisted in Government service.

In the absence of a representative of the Federal Reserve Bank, President Lisle very ably presented the subject of "Trade Acceptances." The remainder of the morning session was devoted to the presentation of the following papers and addresses:

"Finances," by E. A. Barrows, Narragansett Electric Lighting Co., Providence, R. I.; "Financing of Extensions," by Alex J. Campbell, Connecticut Light & Power Co., Waterbury, Conn., and R. S. Hale, Edison Electric Illuminating Co. of Boston; "Line Extensions in War Time," by Alex. Dow, Detroit Edison Co.; "Interconnection and Power Requirements," by Philip Cabot, Turners Falls Power & Electric Co., Boston, Mass.; "Raising of Rates and Coal Clauses," by R. S. Hale, Edison Electric Illuminating Co., of Boston; "Interesting Your Customers in the Securities of Your Company and As Stockholders," by Bowen Tufts, of C. D. Parker & Co., and Percy H. Whiting, Central Maine Power Co.; "Female Employment in Utilities," by Charles H. Parker, Edison Electric Illuminating Co., Boston; "Wholesale Power—How It Is Being Handled," by Frederick P. Royce, Stone & Webster, Boston, Mass.

The Friday evening session took the form of an open meeting with a very interesting and instructive talk on the coal situation by Howell Van Blarcon, a representative of the Fuel Administration at Washington. In his address Mr. Van Blarcon explained the reasons for the shortage of coal and the difficulty in securing sufficient help to work in the mines because of the draft, enlistments and inducements in other lines of work. He stated that there is a shortage of about 200,000,000 tons over 1915, but it is hoped to reduce this amount to 50,000,000 tons. To relieve this situation, it will be necessary to close isolated plants and non-essential industries, restrict the use of elevators and lighting and heating in public buildings.

Another feature of this session was an illustrated talk on shipbuilding at Hog Island, Philadelphia, by W. H. Blood, Jr., assistant to the president, American International Shipbuilding Corp., and past-president of the National Electric Light Association. In the course of this talk Mr. Blood told of the unjust criticism to which this enterprise has been subjected and reviewed the remarkable accomplishments of the Hog Island shipyard during the past year.

The session of Saturday was opened by a talk on "Making Quantity and Service the Basis for Price," by John J. Gibson, of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This was followed by an address, "Co-operation Between Different Branches of the Industry," by W. L. Goodwin, originator of the well-known Goodwin Plan. A very interesting paper entitled "Stimulating Appliance Sales," was also presented by John G. Learned, Public Service Co., of Northern Illinois, Chicago, Ill. Following the annual meeting of Class A members of the association, the convention was concluded with the election of the following officers, who take office January 1, 1919:

President, George B. Leland, Stamford, Conn.
Vice-president, C. R. Hayes, Fitchburg, Mass.
Treasurer, Bowen Tufts, Boston, Mass.

Members of the Executive Committee were elected as follows: F. D. Gordon, Lewiston, Me.; F. A. Belden, Portsmouth, N. H.; H. L. Olds, Brattlesboro, Vt.; R. C. Brooks, Pawtucket, R. I.; E. F. Lawton, Hartford, Conn.; A. B. Lisle, Providence, R. I., and W. L. Mulligan, Springfield, Mass. Miss O. A. Bursiel will continue as secretary of the New England Section.

ORDNANCE DEPARTMENT ESTABLISHES INDUSTRIAL EDUCATION SECTION.

Various Efforts Being Made to Stimulate Production of War Material and Keep Workers Keyed Up to Top Speed.

The Army Ordnance Department announces the establishment of an Industrial Education Section for the purpose of increasing productive efforts in the plants engaged in the manufacture of ordnance material. The activities of the section are under the direction of Maj. F. L. Thompson and Capt. C. R. Dickinson, and will be aimed to carry home to the individual worker, be he employer or employe, the fact that his own personal efforts will have a direct bearing on the winning of the war. The agencies employed include posters, booklets, pay-envelope stuffers, newspaper publicity, display advertising, motion pictures, public speakers and exhibits.

Posters carrying a message of encouragement to the worker tending to inspire greater individual effort are sent out to the manufacturing plants at regular intervals. Some of these, notably "Not Just Hats Off To the Flag, But Sleeves Up For It," have been remarkably successful according to the more than 900 letters received by the Ordnance Department regarding it.

Booklets and pay-envelope stuffers are used to convey inspirational messages to the home and thereby tend to increase the morale of the community. An edition of 2,000,000 of one of the smallest posters ever issued, bearing a message to the individual, was distributed in a number of cities on Labor Day by means of airplanes dropping them over the course of the parade.

In the neighborhood of 1000 plants working on war materials now have motion-picture projection rooms and have been furnished films with a distinct appeal to the worker, such as the Government films "Pershing's Crusaders" and "America's Answer." These films have proved very successful in definitely linking up the work of the man at the lathe with the boys at the front.

In the same manner, speakers, many of them foreign soldiers returned from the front, have been furnished to meetings of plant employes, and have given their hearers first-hand information as to how necessary it is to speed up production. Advertising and publicity in the newspapers by local communities has been advocated and copy furnished from Washington whenever desired.

In some instances it has been found desirable to encourage public exhibitions of locally made material used by the Army as a means of arousing local pride and stimulating interest in war work. Several exhibitions of this kind illustrating the use to which the material was put in actual service, have been the direct means of increasing the pride of the citizens in their town and consequently in their own work.

To stimulate the efficiency of the various war working plants it has been decided to appoint a representative of the Industrial Education Section in each of the eleven district ordnance offices, as follows:

Bridgeport, Conn., Ralph P. Boaz, formerly instructor at Brown and Harvard universities, and a writer and lecturer of note; Boston, D. D. Cassidy, architect; New York, Maj. J. G. Kitchell, U. S. A., formerly president of Etheridge & Co., advertising agents; Philadelphia, J. W. Watson, president of American Bronze Co.; Rochester, N. Y., William H. Gorsline, Rochester Chamber of Commerce; Pittsburgh, Charles Yon, Pittsburgh & Lake Erie Railroad; Detroit, W. G. Pipp, editor *Detroit News;* Cincinnati, Carl M. Jacobs, Jr., vice-mayor and former assistant city solicitor; Chicago, C. L. Benjamin, of Gray & Benjamin, advertising agents; St. Louis, Homer Hall, assistant district attorney. The representative for the Cleveland District has not as yet been appointed.

These men are to be responsible in their respective sections for the activities of the Industrial Education Section which will act as a service agency at the disposal of the various district ordnance chiefs to assist them in increasing productive effort.

SPENDING $2,000,000 ON SHOPS.

The Pennsylvania Railroad will spend approximately $2,000,000 in building a central power station for all electric power used by the company at Altoona, Pa., and for extensions for the Juniata locomotive shops. The Pennsylvania has four power plants in Altoona, but three of them will be abandoned, save for heating the shops and running other machinery for which they now furnish power, outside electrical machinery. The plant at South Altoona will be enlarged. Two 5000-kw. generators will be installed there, which will supply all electric power required, even in emergency cases. The company will save 20,000 tons of coal annually through these changes.

NEW HYDROELECTRIC PLANT BEING BUILT IN OREGON.

The Columbia River Light & Power Co., Cascade Locks, Ore., is building a hydroelectric power plant at that place. The initial unit of 200-kw. capacity is to be ready for service by November. A proposed second unit of 150-kw. capacity is to be installed a few months later. The new plant is on Herman creek, a tributary of Columbia river, and will have a minimum flow of 22 second-feet. The equipment being installed for the initial unit consists of two 26-inch impulse wheels, Pelton type, to be operated under a 380-foot head, at a speed of 600 r.p.m., and a rebuilt National, 3-phase, 60-cycle, 6600-volt generator. The two waterwheels are to be coupled direct to the generator shaft.

Water diverted from the creek is to be delivered to the wheels by means of 1700 ft. of wooden flume, 300 ft. of wood-stave pipe, and 900 ft. of 15-in. riveted steel conduit, all of which has been laid. Plans for the proposed second unit contemplate bringing to the plant water pressure at about 1000-ft. head for an additional wheel and generator.

All power in excess of what is required for lighting the town and the Government locks, is to be sold to the Wind River Lumber Company which operates a 1500-h.p. steam-electric plant, producing electricity for motor drive in its large sawmill and planing mill at Cascade Locks. Like most other concerns of this character, it has outgrown its present plant.

The waterwheels, being installed in the new plant, were built by J. A. Davis, electrical engineer and contractor, Portland, who also rebuilt the generator. The small hydroelectric plant, which has furnished Cascade Locks with light, will probably be moved to the new plant of this company.

NEW ESSINGTON WORKS EXCEEDS SCHEDULE BY FIFTY PER CENT.

The shipyards of our country, which at the present time are working at utmost speed in fulfilling the Government's tremendous shipbuilding program, are in a large part entirely dependent upon the manufacturers who produce the necessary machinery that goes into these ships. These manufacturing establishments are doing more than what is demanded of them, as establishments for winning the war by filling the Government's orders in a fine manner. This war-time spirit has been demonstrated by the Essington Works of the Westinghouse Electric & Manufacturing Co., in South Philadelphia, Pa. Its record for the month of August was not only larger than the shipment for any similar time since the works commenced operations, but it was actually 50 per cent in excess of what its schedule called for.

These works have concentrated their efforts upon the construction of ship-propulsion machinery, such as steam turbines, mechanical reduction gears, condensers, pumps and other auxiliary steam apparatus, all of which comprise the Westinghouse marine power system. One hundred per cent of the material is being turned out on Government contracts; 90 per cent of this is for the United States Navy.

Up to September 1, the company had shipped to the Submarine Boat Corporation, of Newark, N. J., a

complete equipment of ship-propelling apparatus for eight vessels, and 20 complete sets of line shafting. The entire steam-power equipments for two vessels, together with six complete sets of line shafting had been furnished to the Merchant Shipbuilding Co. The Newburgh Shipbuilding Co., of Newburgh, N. J., has been furnished two complete sets of line shafts and the United States Navy Yard at Norfolk, Va., was supplied with two complete sets of turbines and reduction gears for a revenue cutter, as well as two sets of reduction gears for destroyers.

While the men in the shipyards build the hulls and the framework, they are but constructing the skeleton, while it is the men at the manufacturing works throughout the country who furnish the machinery which makes the launching of the ships possible as well as the power which makes the ships move over the Atlantic to Europe, and thus helps to win the war.

A keen spirit of friendly rivalry exists among the employes of the various departments of the Essington Works, which serves the plant by speeding up the production of the different departments. Everyone seems to realize that in carrying out the Government's shipbuilding program they are doing work of the most vital importance.

ELECTRICAL CONTRACTOR-DEALERS OF OREGON MEET AND DISCUSS THEIR PROBLEMS.

Papers Dealing With Contracting and Merchandising Are Read.

The Oregon Association of Electrical Contractors and Dealers held a regular meeting at Portland on September 20 and 21, at which there was an attendance of 75 per cent of the members in the state. The afternoon of the first day was devoted to sessions of the state executive committee and local committees at the office of the state secretary. A dinner in the evening was followed by a general business meeting, presided over by P. W. Paul, when reports of officers and of committees were read. The report of J. W. Oberender, secretary, showed the association had 33 members who are members of the national association; it disclosed the fact that a good many members had resigned within the last year by reason of war service and of conditions arising from the war.

Reports were made by S. C. Jagger, Portland, as chairman of Committee on Industrial Development; by F. C. Green, Portland, of Legislative Committee; by R. C. Kenny as committeeman on Labor; by E. Pierce on House Wiring; by J. H. Sroufe as chairman of committee to confer with Jobbers' committee; by C. P. Scott on Credit and Accounting; by S. C. Jagger as member of committee to confer with architects; by J. W. Oberender on Publication Work; a report of the committee on Liability Insurance Rates was read by the secretary.

In discussing the labor situation, Mr. McKenny of NePage-McKenny Company, said that in Portland and vicinity there were now between 450 and 500 skilled electrical men in the industries as against 200 prior to the war; and all were fully employed in shipbuilding and the general industries. If under the new draft regulations, 50 per cent of these are taken in army and navy service, the result will be a scarcity of skilled workers. He reminded contractors of their privilege of giving information as to the essential character of work they may have in hand, so that they may retain the necessary crews of men.

The discussion brought out the fact that contractors are and have been fully engaged this season, and that the proposed plan of having 2000 houses built to accommodate employes in war work and other industries, would mean that a considerable amount of new wiring must be done.

C. P. Scott, of Scott Electric Company, Portland, showed the advantage of accounting and record keeping under the classification outlined by the national association as a means of standardizing it.

J. H. Sroufe, of Jagger-Sroufe Company, Portland, discussed relations with electrical jobbers, and showed the present and prospective good results of having contractor-dealer committees co-operate with jobber committees. The better understanding that comes of such co-operation would open the way eventually to removing the disadvantages under which contractors find themselves where the jobbers are competitors.

The merchandising feature was brought up in a report by the merchandising committee of which B. W. Paul of Medford is chairman. Heavy sales of appliances in other cities were cited as stimulus to Oregon contractor-dealers to develop their cost systems and sales methods.

The second day's session, which was presided over by R. C. Kenny, was devoted to the reading of papers, discussion and an automobile trip. In the evening the delegates took dinner at Crown Point Chalet on Columbia Highway.

Papers read were as follows: B. W. Paul, Medford, "Electrical Retail Merchandising"; Chas. H. Carey, state chairman of War Industries Board, on "Priorities and War Industries Program"; Geo. L. Oman, northwest manager of Pacific States Electric Company, Portland, giving "Observations of a Jobber"; C. P. Scott, Portland, on "Turnover as It Affects Profits."

Mr. Paul discussed overhead costs and emphasized how essential it is to know them. He showed how necessary it is to divorce the contracting from the merchandising departments, and to employ competent sales help.

Mr. Carey's address was one calculated to help keep up the patriotic ardor of the members of this industry, and said the priorities program undoubtedly would affect the electrical industry as to labor, material and capital, except where its activities related to some phase of the war.

Mr. Oman's paper dealt with competition and co-operation in the electrical industry, and especially discussed fair competition and helpful co-operation between the branches of the industry.

Mr. Scott's paper was analytical of all phases of buying, selling, cost-keeping and especially the relations of frequent and infrequent turnovers to the net results in a year's business.

The British Columbia Association of Electrical Contractors and Dealers, which recently joined the National Association of Electrical Contractors and Dealers of the United States, was represented at the Portland convention by Capt. W. J. Conway, secretary, C. H. E. Williams, past president, and P. F. Letts, all of Vancouver. E. J. Brettell was recently elected president of the association of that province.

One of the expressions of the Oregon association was in favor of the closer co-operation of the associations of Washington, Oregon and British Columbia, and a plan was initiated to hold a joint convention of the three associations early next year to consider matters of mutual interest.

AMERICAN GEAR MANUFACTURERS MEET

Semiannual Meeting at Syracuse Discusses War Problems and Inspects Several Great Works.

The semiannual meeting of the American Gear Manufacturers' Association was held at Syracuse, N. Y., Sept. 19 to 21. The meeting was called to order in the Hiawatha Room of the Hotel Onondaga by President F. W. Sinram with a rousing address, "Carry On," delivered in his well-known energetic and forceful manner. On Thursday evening the members were the guests of the Brown-Lipe-Chapin Co. and the Brown-Lipe Gear Co. at an informal dinner.

On Friday, the morning sessions of the association was addressed by C. A. Otis, chief of Resources and Conversion Section of the War Industries Board, who chose the comprehensive subject of "Priority" and electrified the meeting by his appeals to patriotism and his mention of the solution to the labor problem being in the importation of German prisoners of war, as well as Chinese in large numbers, to this country to relieve the labor shortage of the factories. W. H. Diefendorf also addressed the meeting on the subject, "What Is the Possibility of Women Becoming a Permanent Factor in the Gear Industry?" He advocated the employment of women and spoke of the success thus far obtained in this direction in the factories of the New Process Gear Corporation. Luncheon was served to the members at the works of the New Process Gear Corporation, followed by an inspection of the works, as well as the factories of the Brown-Lipe-Chapin Co. and the Brown-Lipe Gear Co. The ladies of the convention were entertained by an enjoyable automobile ride with luncheon at Krebs' Inn, Skaneateles, N. Y., on Lake Keuka. On Friday evening came the informal banquet at the Hotel Onondaga, followed by dancing.

On Saturday morning, C. E. Stuart, of the Central Steel Co., Massillon, Ohio, spoke on "The Outlook of the Steel Supply." His remarks included an interesting narrative of the solution found by the Central Steel Co. to the housing problem, solved by an organization fathered by the company which has expended several hundred thousand dollars in dwellings for its workmen, and occupied on a rental or land-contract-purchase basis. C. E. Crofoot, of the Crofoot Gear Works, read a timely paper advocating trade acceptances as a solution to the shortcomings and evils of the open book account and promissory note credit systems. Messrs. Ganschow and Foot, of Chicago, spoke on credit methods, and also on the interchange rental system of hobs as a measure of war conservation. The gathering ended Saturday afternoon with meetings of the War Service Committee and the Standardization Committee.

WASHINGTON ASSOCIATION OF CONTRACTOR-DEALERS JOINS NATIONAL BODY.

Officers Elected and State Secretary Is Chosen.

The Washington Association of Electrical Contractors and Dealers, which held its third annual convention at Seattle, September 12, took formal action to join the national association. The scope of this action was the adoption of the constitution provided by the national association, with an amendment to the effect that it be made to conform to that of the original Washington association, and that all members in good standing in the old association become members of the national association.

V. S. McKenny of NePage-McKenny Company, Seattle, was re-elected president. Vice-presidents for the several districts of the state were elected as follows: Seattle district, J. J. Agutter, W. M. Meacham and S. G. Hepler; Spokane district, M. V. Burr and J. R. Mitchell; Bellingham district, J. L. Pegram; Tacoma district, H. P. Deweese; Yakima district, F. E. Smallidge of Wenatchee.

The executive committee, comprising the president and vice-presidents, chose Forest E. Smith, Seattle, as secretary-treasurer.

PUBLIC SERVICE RAILWAY COMPANY GRANTED RATE INCREASE.

The Board of Public Utility Commissioners, New Jersey, recently handed down a decision, granting the Public Service Railway Co. permission to charge a 7-cent fare on its traction lines throughout the state instead of a 5-cent fare as heretofore, with addition of 1 cent charge for transfer. The order becomes effective Oct. 15, to remain in force until March 31, 1919, at which time a 6-cent fare is to be charged until further order from the Board. The Board holds

Group of Members and Guests in Attendance at Semiannual Meeting of American Gear Manufacturers' Association.

that as a war emergency measure the company is entitled to this increase.

WAR CONSTRUCTION SHOWN TO BE ON HUGE SCALE.

Illustrated Lecture by Colonel Junkersfeld on Emergency Construction for the War Department.

A graphic idea of the immensity of the construction work undertaken by the Government since we entered the war was presented in a very instructive illustrated lecture delivered by Col. Peter Junkersfeld, of the Construction Division, Quartermaster Corps, U. S. A., before the technical men of Chicago on the evening of Oct. 1. The meeting was held in the Art Institute under the auspices of the War Committee of the Technical Societies of Chicago. The address was entitled, "Emergency Construction for the War Department in the United States," and dealt chiefly with the construction of cantonments, warehouses, port terminals, hospitals and miscellaneous army buildings; mention was also made briefly of the shipyard and shipbuilding operations of the Emergency Fleet Corporation. Army construction work completed and under way totals about one billion dollars, while shipyard work complete and under construction amounts to between two and one-half and three billions.

Of special interest in the lecture was the description of the method of awarding construction contracts, contract forms used and the safeguards employed to prevent exorbitant charges and other profiteering. The emergency character, novelty and enormous scale of the work necessitated awards different from the proposal and fixed sum basis usually followed in normal times. Colonel Junkersfeld said the "cost plus" contracts did not provide for large percentage profits. He explained the organization of the Construction Division and how it has greatly facilitated the work.

Aside from the cantonments, special interest attached to the construction of the eight huge port terminals, the one at Brooklyn alone costing about $40,000,000. Of the warehouses, the group of these buildings being erected in Chicago will contain the largest refrigerating plant in the world. All of the work has been planned on such a large scale as to insure the only allowable outcome of the war—definite victory of justice and democracy over brutality and autocracy.

MOTOR DRIVE FOR GOVERNMENT SPRUCE PRODUCTION MILL.

Features of Electrical Equipment for a Connected Load of 2325 Horsepower.

The main sawmill, cut-up plant and finishing mill being built and electrically equipped at Toledo, Ore., by the Spruce Production Division, Bureau of Aircraft Production of the War Department, involves the construction of a steam-electric plant and the installation of 87 motors that will afford a connected load of 2325 hp. for driving saws and other wood-working machinery.

The steam equipment, furnished by Chas. C. Moore & Co., consists of eight 250-hp. Stirling boilers, which are being set in batteries of two boilers each. Wood refuse is to be used as fuel. The steam produced, besides being used for driving the turbine, will be required for operating carriages and log turners and other purposes.

The turbogenerator and accessories comprise an Allis-Chalmers 1850-kw., high-pressure, condensing steam turbine unit, with high vacuum jet condenser, the turbine to be operated at 150-lb. steam pressure and 28-in. vacuum. This is an alternating-current generator, which is rated for 80-per cent power-factor, 480 volts, 3-phase, 60 cycles, and a speed of 1800 r.p.m.

In reference to lighting, it is intended that energy for this purpose shall be supplied direct from the turbogenerator, when that unit is in operation, by means of a lighting transformer, whereby electricity at 480 volts will be stepped down to 110-220. When the main generating unit is not operating, the lighting will be supplied by an Allis-Chalmers 35-kw., 3-wire, 110/220-volt direct-current generator, driven by a Skinner automatic engine.

The switchboard equipment, being furnished by the Allis-Chalmers Manufacturing Co., consists of one double exciter panel with voltage regulator; one alternating-current generator panel; two 800-ampere double-circuit feeder panels; one 800-ampere single-circuit feeder panel; one lighting panel for both the regular and auxiliary lighting.

The main sawmill machinery requires 35 alternating-current motors, wound for 440 volts, 3 phase, 60 cycles, which will make a connected load of 1422½ hp. The capacities, types and speed of these motors, which are of Allis-Chalmers manufacture, are given herewith, together with method of connections to machines driven:

One 10-hp., squirrel-cage, belted, to run at 1150 r.p.m.

One 100-hp., slip-ring, direct-connected, speed of 860 r.p.m.

One 75-hp., slip-ring, belted, speed of 690 r.p.m.

Nine 10-hp., slip-ring, reversible back geared, speed of 860 r.p.m.

Two 10-hp., slip-ring, back-geared, speed of 860 r.p.m.

One 60-hp., slip-ring, direct-connected; speed 690 r.p.m.

One 60-hp., slip-ring, direct-connected; speed, 860 r.p.m.

One 3-bearing, 250-hp., slip ring, belted; speed 700 r.p.m.

One 3-bearing, 300-hp., slip-ring, belted; speed, 700 r.p.m.

One 300-hp., squirrel-cage, direct-connected; speed 1160 r.p.m.

Five 5-hp., squirrel-cage, belted; speed 850 r.p.m.

One 10-hp., slip-ring, belted; speed 1150 r.p.m.

Three 15-hp., slip-ring, belted; speed 1150 r.p.m.

Three 7½-hp., slip-ring, belted; speed, 1150 r.p.m.

One 5-hp., slip-ring, belted; speed 1150 r.p.m.

One 30-hp., squirrel-cage, direct-connected; speed, 1150 r.p.m.

The cut-up plant, which will require 38 440-volt motors, making a connected load of 637½ hp., is designed to work up the product of the main sawmill. The motors and other electrical equipment for this plant are to be ordered in the near future.

The finishing mill, in which the spruce wood parts are to receive the necessary finish for use in aircraft construction, is to be electrically operated throughout. The 14 motors having a connected load of 265 hp., which will be required for this part of the great plant, are also to be ordered in the near future.

Do your uttermost, not only your "bit." Buy bonds, and more bonds.

Commercial

Electrical Cooking and Heating Appliances Promote Coal Conservation — Electric Pumps for Reclamation Work

USE OF ELECTRICAL HEATING APPLIANCES PROMOTES CONSERVATION.

Summary of Principal Arguments for Electric Cooking and Heating Appliances and Data on the Coal That They Conserve.

The savings which can be effected by increasing the use of electrical heating appliances are of special interest to central-station salesmen and local dealers at this time. With the conservation of fuel, food and certain metals fast becoming acute national issues, this saving comes into prominence as a patriotic measure. The principal electrical appliances involved in this saving are: electric flatirons, ranges and bake ovens, table cooking devices, air heaters for the home and water heaters, also numerous special devices, such as heating pads, immersion heaters, etc.

The amount of raw materials which can be saved by the use of electrically heated apparatus deserves special recognition. For example, it is a well-known fact that every electric iron sold replaces anywhere from two to five of the old-fashioned sad irons, which individually required more steel in their manufacture than the electric iron. Electric ranges also require considerably less steel than coal ranges. With steel in such demand for shipbuilding and munition manufacture, every possible means should be used to conserve it as much as possible and the use of electric appliances should be urged as a conservation measure for this reason alone.

However, an actual saving in food can be accomplished by the use of electric appliances and this saving is one which is especially noticeable to the consumer. Food prepared on electrical equipment is frequently prepared at the table by those who will consume it. This solves the servant problem to a certain extent and likewise does away with all leftovers and resultant waste. These savings are especially noticed by single people who live alone in bachelor quarters or the like, and by families that have had their numbers depleted by the war. Moreover, it is an established fact that meats will not shrink as much when cooked electrically as when cooked by coal or gas directly, this saving amounting to from 4 to 8%.

The principal saving, however, is in fuel and the labor which is necessary to supply the fuel. Coal used for home consumption must necessarily be of a high grade which usually means that it must be brought from a considerable distance to the coal distributor who in turn must deliver it to the individual householder. The coal used by central stations in the manufacture of electricity is of a poorer grade, usually that kind which is most accessible; and is unloaded directly from the trains at the generating stations.

All of these electrical devices are of high efficiency, developing their heat close to where it is to be applied and therefore utilizing a very large percentage of the energy delivered to them. The boilers, engines and generators, or turbines which serve to transform the coal into electrical energy are also as efficient as modern engineering can make them. In this way it can be seen that a minimum amount of coal is wasted by electrical appliances, whereas the fuel wasted by the old-fashioned cook stoves, etc., which had to have their entire surfaces brought up to a high temperature in order to heat one pan is evidently much greater.

If steam-driven electrical plants, only, were to be considered, an immense saving in coal could be shown, but fortunately a large percentage, at least 70% of the larger ranges and ovens and fully 50% of the smaller apparatus, are used on the lines of hydroelectric power plants where a 100% fuel saving can be shown. This water power exists, the apparatus is already in place to transform it for use on electrical appliances and the water flows just the same whether its power is used in this way or if the equivalent amount of heat is taken ineffectively from coal which has been hauled a considerable distance by much needed trains.

An approximate idea of the actual saving accruing from the use of electric irons and ranges can be had from the following data, which were supplied by one of the largest manufacturers of this equipment.

Coal Loss Due to Unused Water Power.

The loss in terms of coal for each unused kilowatt-hour of water power which might be used in electric heating devices is as follows, as determined:

Through range operation.....6 lb. per kw.-h.
Through flatiron operation.....9 lb. per kw.-h.

These figures are based on the following findings:

Coal consumed per month in average coal range, actually from 1000 to 2000 lb., but conservatively estimated at.....800 lb.

Electrical energy consumed per month in average electric range (based on average of 25,000 ranges) .....125 kw.-h.

800 ÷ 125 = 6+ lb. of coal replaced by 1 kw.-h.

For directly heating flatirons from coal, the average family seems to use at least 4½ scuttles per month (over and above the amount otherwise used to hold the kitchen fire or merely heat part of the house) or about .....108 lb.

Electric flatiron consumption per month (based on 5 hours of ironing per week) is.....11.9 kw.-h.

108 ÷ 11.9 = 9+ lb. of coal replaced by 1 kw.-h.

Coal Equivalents in Ironing.

From inquiry from a number of housekeepers, it appears that the ironing period per week varies from 2 or 3 hours for the smallest families to a full day for perhaps the largest; from the same source it appears that from 1 to 3 scuttles of coal are required for each ironing (that is over and above the amount otherwise used to hold the fire or heat the kitchen). Estimating conservatively, the average coal required per ironing may be taken as one scuttle and estimating adversely

to electric irons the average period may be taken to be 5 hours.

By inquiry it seems that ironing by a gas range requires two gas-range burners or from 20 to 40 cu. ft. of gas per hour; 30 cu. ft. per hour or 150 cu. ft. of gas per ironing requires 28 lb. of coal for its manufacture per week.

Five hours' ironing with an electric iron requires 2.5 kw.-h., requiring on the average 2 lb. of coal to produce each kw.-h., or a total of 5 lb. of coal for the 5 hours.

Comparing, for ironing: 5 lb. of coal used electrically, is equivalent to 28 lb. of coal in the form of gas, and is equivalent to 25 lb. of coal used directly in a kitchen range.

Fuel Conservation with Electric Ranges.

Steam Power Plant.

Coal consumed per month by the average family in coal range varies actually from 1,000 to 2,000 lb. per month. For purposes of comparison and at the same time to be conservative, we will assume 800 lb. per month .....800 lb.

Electric range consumption per month (average of 25,000 ranges).....125 kw.-h.

Coal consumption of electric range per month 2.1 lb. of coal per kw.-h. 262.5

Coal saved per month..... 537.5 lb.
Coal saved per year.....6450. lb.

Water-Power Plant.

Coal consumed per month by the average family in coal range, for cooking..... 800 lb.

Electric range consumption of coal per month, average ..... 00 lb.

Coal saved per month ..... 800 lb.
Coal saved per year .....9600 lb.

Saving in Coal Anticipated Through Use of 10,000 Electric Ranges.

Experience has shown that about:

80% of electric ranges are substituted for coal-burning ranges.

10% of electric ranges are substituted for oil-burning ranges.

5% of electric ranges are substituted for wood-burning ranges.

5% of electric ranges are substituted for gas-burning ranges.

Nearly all of the gas in the last group being obtained from coal.

Experience has also shown that at least 70% of all electric ranges are used on circuits where the electricity is generated from water power, and less than 30% with steam-generated electricity.

A given 10,000 new electric ranges may then be anticipated to displace ranges now consuming these amounts of fuel:

80% of 10,000 or 8000 coal ranges, each consuming not less than 800 lb. of coal per month, or together, $8000 \times 800 \times 12 \div 2000$ tons of coal per year, or consume annually coal aggregating 38,400 tons.

10% of 10,000 or 1000 oil ranges consume considerable oil, not coal, therefore omitted in the present analysis.

5% of 10,000 or 500 wood-burning ranges consume considerable wood, not coal, therefore omitted in this analysis.

5% of 10,000 or 500 gas ranges, each requiring about 500 lb. of coal per month at the gas plant (estimated on a large number of monthly gas bills), or together, $500 \times 500 \times 12 \div 2000$ of coal per year, or consume annually coal aggregating.....1500 tons

Therefore, 10,000 new electric ranges will displace ranges otherwise consuming annually coal amounting to the sum of the above items, or 39,900 tons, in addition to considerable oil and wood.

10,000 new electric ranges will consume, annually, coal as follows:

30% of 10,000 or 3000 electric ranges will be supplied with electricity generated by steam, and will require each on the average, 262.5 lb. of coal per month at the central station, or together $3000 \times 262.5 \times 12 \div 2000$ tons of coal per year, or consume annually, coal aggregating.....4725 tons

70% of 10,000 or 7000 electric ranges will be supplied with electricity generated by water power, and consume no coal..... 000

or 10,000 electric ranges consume annually, coal .....4725 tons

Therefore, 10,000 new electric ranges will save annually, coal, the difference between 39,900 tons and 4725 tons, or .....35,175 tons

Annual Saving in Coal by Average Electric Flatiron.

Assuming that of the families purchasing electric irons, 85% would otherwise iron from gas ranges and 15% from coal ranges.

Electric Irons on a Fuel-Consuming Circuit:

85 irons heated from gas ranges require each week, 85×28 lb. of coal, or.....2380 lb.

15 irons heated from coal ranges require each week, 15×25 lb. of coal, or..... 375 lb.

Hence, these 100 coal and gas-range-heated irons require $2380 + 375 = 2755$ lb. of coal each week.

100 electric irons substituted therefor and supplied from a fuel-consuming circuit, require each week $5 \times 100 = 500$ lb.

Therefore, 100 such electric irons save each week $2755 - 500 = 2255$ pounds of coal, or an average of, say, 22½ lb. per week each; and annually (assuming only 45 ironings per year), $22\frac{1}{2} \times 45 = 1012$ lb. per iron.

Electric Irons on Water-Power Circuit.

100 coal and gas-range-heated irons require each week (as above).....2755 lb. of coal

100 electric irons substituted therefor, will require no coal, since supplied from water power.

Therefore, 100 electric irons on a water-power circuit, save each week, $2755 - 0 = 2755$ lb. of coal, or an average of, say, 27½ lb. per week each; annually (assuming only 45 ironings per year), $27\frac{1}{2} \times 45 = 1247$ lb. per iron.

Hence, the average electric iron (50% of all irons being on water-power circuits), saves $(22\frac{1}{2} + 27\frac{1}{2}) \div 2 = 25$ lb. of coal per week; and $25 \times 45 = 1125$ lb. of coal annually.

It must not be understood, however, that all the saving is represented in the saving shown by ranges and flatirons. The fact that nearly all electrical appliances generate their heat almost instantly and that it can be applied so easily to the place required makes nearly all the appliances listed fall in line for conservation. For example, the small radiant heater can be carried from place to place and its heat directed where it is most needed which does away with starting the

house-heating furnace or boiler in the late fall or early spring days.

The Government itself recognizes the advantages of electrically heated apparatus and their use is becoming more common every day in the Government service. The navy uses electrical ovens and ranges on board its large ships, submarines and in its training stations. The army also uses them together with all sorts of special heaters in the cantonment camps, field hospitals, etc.

There is, of course, no argument necessary to point out the benefits to be derived by the central station by the addition of such electric heating load. It is substantially an off-peak load, requiring practically no additional generating or transmitting capacity. It can be connected to the lines as readily as a lamp socket and once in use gives almost no trouble.

NO CITIZEN WANTS UTILITY TO OPERATE AT LOSS.

The San Diego *Herald*, in its issue of Sept. 5, published an editorial concerning the proposed increase in gas and electricity rates and in street-railway fares in San Diego, Cal., from which the following paragraphs are quoted:

"The increased cost of everything pertaining to the operation and maintenance of these utilities makes it impossible for them to continue the present service at present price without loss. Therefore, they are entitled to such increase as will insure them a return on their investment.

"The Commission is in duty bound to accord the needed relief to these corporations and will do so whether it pleases the public or not. It may be proper for the city officials to see to it that the Commission is not too generous in its allowance, but it is foolish to oppose a reasonable demand.

"There will be, no doubt, certain individuals who will take this opportunity to vent their spite by opposing any increase, and there will be demagogs who will take this opportunity to play to the public. However, the people generally are honest and will cheerfully abide by any decision the Railway Commission may make. No honest citizen would wish to see the utility companies doing business at a loss."

ELECTRIC POWER BEING INCREASED AT ASTORIA, ORE.

Pacific Power & Light Co., Portland, Ore., is installing additional equipment at its reserve power plant in Astoria, consisting of a 700-hp. steam engine and a General Electric 750-kv-a. generator, the two being direct-connected. The increased equipment will give its reserve plant a capacity of 1600 kw. This company, which buys considerable power at wholesale from Hammond Lumber Co., is sole distributor of electric power at Astoria and towns in that vicinity. The power load at Astoria, in shipyards, shops and factories, amounts to 2000 kw., and there is demand for a considerable increase.

ELECTRIC PUMPS FOR RECLAMATION WORK.

Diking District No. 4, Kelso, Wash., has bought two Platt Iron Works 20-in. centrifugal pumps, each direct-connected to a General Electric 75-hp. motor. Each pump has a capacity of 10,000 gallons per minute, at a maximum lift of 15 ft. over the dike. The installation is to be completed this fall. The district will buy electric power from the North Coast Power Co.

Drainage District No. 1, also at Kelso, is installing a 12-in. pump, direct-connected to a General Electric motor, to operate at 900 r.p.m., 2200 volts; the pump is rated to handle 4000 gallons per minute against a head of 15 ft. These pumping equipments were sold through Gordon & Finkbeiner, sales engineers, Portland, Ore. The method of operation was described and illustrated in the ELECTRIAL REVIEW of Sept. 21, 1918, page 461.

NORTH COAST POWER CO. TAKES ON ADDITIONAL POWER LOADS.

North Coast Power Co., operating in parts of Southwestern Washington, is now supplying 200 hp. in electrical energy to the Superior coal mine at Chehalis, at which power is required for operating an electric hoist and a motor-generator set, the latter producing direct current for mine haulage. This coal, which consists of an 11,000-B.t.u. lignite, is shipped to Portland for use in one of the steam-electric plants of the Portland Railway, Light & Power Co.

The North Coast company has recently taken on a 100-kw. load at the Chehalis plant of the Carnation Milk Products Co., which shut down its steam-generating plant when it decided to use central-station power. Some steam is still used for heating and cooking. The machines, electrically operated, consist of pumps, refrigerating equipment, agitators, conveyors, box-making machines and soldering tools. The change required the installation of a bank of transformers.

LUMBER MILL TO GENERATE POWER FOR CENTRAL STATION.

The Hammond Lumber Co., Astoria, Ore., has ordered equipment for a steam-electric plant to produce power which will be wholesaled to the Pacific Power & Light Co., and which the latter is to distribute to shipyards and other industries in the vicinity. The equipment comprises Erie City boilers of the combined capacity of 1800 hp., and a General Electric 1500-kw. turbogenerator; also a Beyer barometric condenser, whereby the turbine will run condensing; and a 3000-hp. Cochrane feed-water heater, and the necessary circulating and other auxiliary pumps. The new plant is being built on the premises of the Hammond lumber mills, and mill refuse is to be used as fuel under the boilers. The boilers, condenser and heater were sold by Gordon & Finkbeiner, Portland, Ore.

BIG GAINS IN MINNEAPOLIS BUSINESS.

The sales department of the Minneapolis General Electric Co., Minneapolis, Minn., during the week ended Sept. 20 accepted 584 new customers with 343 kw. of lighting and 70 hp. in motors. New business connected to the company's lines shows a gain of 234 customers with 247 kw. in lighting and 574 hp. in motors. This includes 480 hp. for the Minneapolis Steel Machinery Co. and 75 hp. for the Waconia Light & Power Co. Electric energy output was 12 per cent greater than for the corresponding week last year. The total kilowatt-hour output amounted to 5,495,930 kw-hr., which is in excess of any one week's output in the history of the company.

Operating

Cable Pulling—Modified Civic Code—Feeder Rack—Instrument Signals—High Vacuum Hints—Line Economics

POWER WINCH FOR CABLE PULLING.

Economies Obtained by Replacing Men by a Machine.

Anything that saves materials or men these days deserves consideration and meets with deep interest, because two of the outstanding conditions today are the shortage of both materials and men.

Central-station companies have suffered particularly severely in the way of labor, because being unable to offer the financial inducements that munitions manufacturers and similar employers of labor are able to hold out. The matters of reducing the amount of man-power required for any job, and making work simple and easy so that what labor is obtained may be retained, are of great importance in these times of labor shortage, therefore.

The James Sugden Co., underground cable contractors, of Boston, adopted last spring a method of conserving man power, which for them means doing what they might otherwise be unable to do, or in any case doing it cheaper, that ought to interest every central-station or distribution company operating underground distributing or transmission systems. This company purchased a Mead-Morrison friction drum power winch for one of its large trucks employed for laying underground conductors. The truck was a 4-ton Packard.

Before using the power winch on the truck the James Sugden Co. carried 13 men in a gang when installing or pulling out 3-conductor cable with a hand winch. Now, by using the power winch, they are able to do the same work with 8 men, doing away with 5 men previously necessary, with a saving of over $15 per diem for wages, making a yearly total more than sufficient to buy a new truck. This is not the only gain, however. Whereas with hand winch an average of 2000 ft. of cable was pulled daily, or 20 ft. per minute, with the Mead-Morrison winch 3200 ft., or 40 ft. per minute, can now be pulled. In other words, installation of a power winch on a truck for cable pulling has in this case reduced the labor cost over $15 per day, increased the rate of work 100 per cent, and yet made the work easier for the men.

Make your dollars fight. Buy Liberty Bonds.

CONSERVING MATERIAL FOR INTERIOR WIRING.

Conductors Installed for Maximum Demand Instead of Connected Load in Vogue as War Measure.

Scarcity of copper and conduit, as with almost all materials, and the general tendency and desirability for conserving materials for prosecution of the war, has made itself felt acutely among contractors and others concerned with the erection of structures, and so forth. Many contractors are finding it increasingly difficult to obtain the materials necessary for completing jobs, even when for essential work and supported by priority orders.

In one large middle-west city the lack of copper and conduit has resulted in modification of the electrical code for certain essential installations. For example, in installing the conductors and interior wiring of an ice plant for cold storage, or motors for munitions work, whereas the city electric code calls for sufficient conductor cross-section to carry the connected load with a given temperature rise, modification of the rule is now made so that the interior wiring is installed to take care of the maximum demand instead of the connected load. The maximum demand refers to a half-hour period.

The maximum demand for various classes of industrial plants is known by the central-station company from large masses of data obtained by maximum demand and wattmeter records. These data, with the connected load and the required and proposed electrical conductors, are then submitted to the chief city electrical inspector who passes upon the matter. The copper saved by this temporary arrangement is worth while and often very convenient. For example, in a plant containing 10 motors, making a total connected load of 200 hp., instead of having current-carrying capacity for 200 hp. for a certain class of service, current-carrying capacity of 125 hp. might suffice. This means a considerable saving in copper used, also in the cost of the installation.

Most central-station companies install transformers, meters and service wires capable of caring for the average demand instead of the full connected load, according to the class of service, from which the diversity and load-factors are obtained by experience. What has been mentioned above really amounts to the same thing except that it applies to the interior wiring paid for and owned usually by the customer instead of being installed by and owned by the utility.

Help harass the Hun, hasten victory. Buy bonds.

SAFETY FEATURES OF 13,000-VOLT FEEDER RACK.

Guarded Walkway, Guarded and Marked Live Parts and Adequate Illumination Features.

Not infrequently steel transmission line structures offer too few safety features for men climbing and working upon them. And the more true this seems to be the more complicated and heavily loaded the structure. Also it is a common failing to find that the illumination is such that switching, identification of circuits and phases is difficult, and movement not free from risk because of shadow cast or improper light density.

The accompanying illustration shows a steel rack carrying a large number of 13,000-volt circuits and

their necessary equipment on the system of the Counties Gas & Electric Company, at Norris, Pa. This rack has a number of interesting engineering features because of the large amount of equipment and its compactness, but it is also a good example of safety engineering. The walkways can be seen to be well guarded by railings and the floor to be of well-laid wood, the one preventing falling and the other obviating stumbling. Lightning arresters and live parts within reach are well guarded and should one stumble, the metallic netting, which is rigidly grounded, prevents possibility of electric shock. It should also be noted that all conductors are conspicuously marked, so as to reduce expenditure of time in doing work, while making for safety to men and service. Another feature working toward this same end is that electric lights are seen to be installed in such locations as to throw light upon the walkways and upon equipment.

We cannot carry rifles, but we can carry the Liberty Loan "over the top."

HINTS FOR MAINTAINING HIGH VACUUM.

The requirements of a first class packing in condensers are that it shall be permanent, shall fill every crevice so completely that leakage is impossible, shall save labor. A packing should be also able to resist alkalis, acids, salts and such chemicals in solution. It is well known that pure circulating water is seldom found in central stations, water works plants, large industrial plants, etc.

Since the efficiency of steam turbines and condensing engines is dependent upon high vacuum, and since 12,000-tube condensers are not unusual these days, it is evident that the 24,000 tube packings in such condensers must be as good as human ingenuity can make them. They must prevent leaks dependably and permanently.

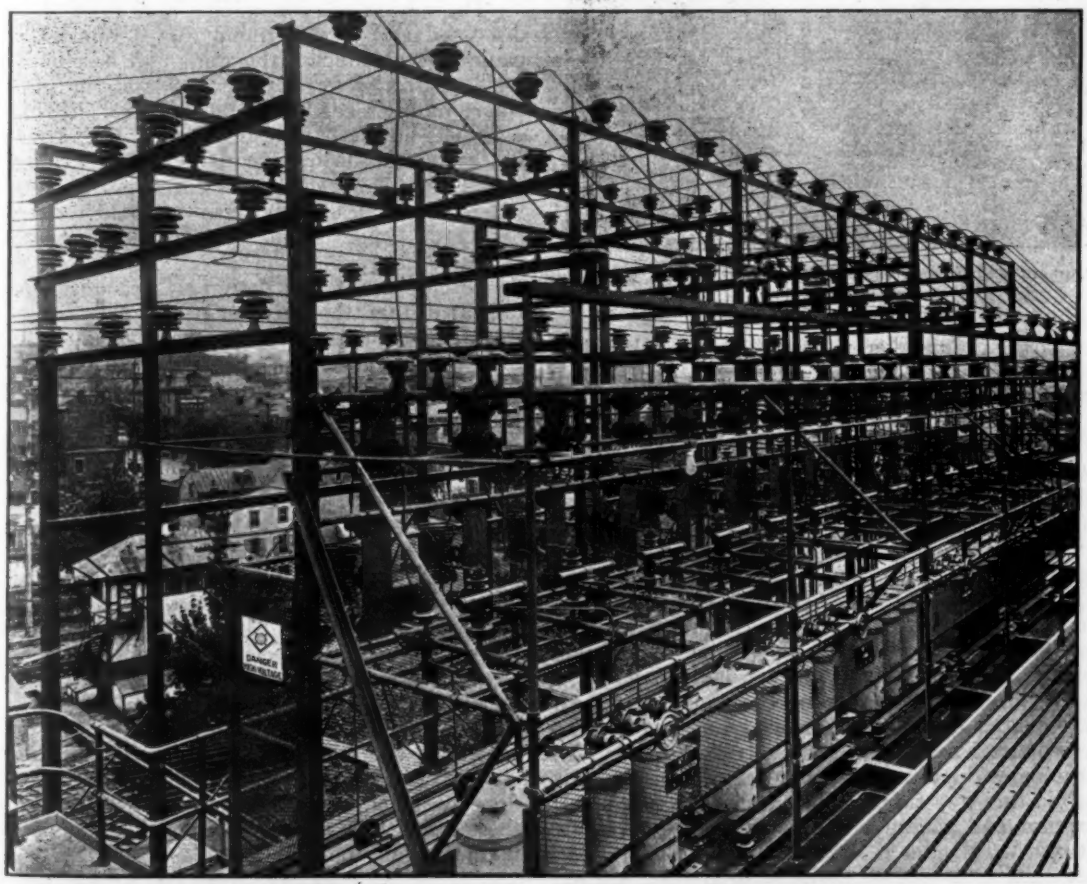
Cotton wicking, corset lacing, and fiber rings are not satisfactory. They are not permanent. They eventually deteriorate under the action of steam, water, air, oil and heat. Sometimes they become hard or cement themselves into the tubes, causing the tubes to buckle. At best they are only temporary, the approximate life being in the neighborhood of a year. And flooding the condenser to locate leaky tubes is an expensive procedure.

No matter how efficient any vacuum pump may be, it cannot maintain a high vacuum if the engineer in charge is careless about air leaks. Two places that are frequently overlooked in sealing leaks are the low pressure cylinder valve and piston rod stuffing boxes. The pressure around these boxes, remember, is toward the inside and not toward the outside. One can detect leaks through these stuffing boxes by holding a flaming torch close to them and noting whether or not the flame is sucked in. To make a good torch, simply dip a pine stick in alcohol and ignite.

This torch method can also be supplied in finding leaks around steam pipe joints leading to the condenser or around the condenser tubes themselves. The condenser must be under vacuum, of course, when the test is made.

Where a steam turbine is used instead of a reciprocating engine, the flame method is similarly applicable to finding leaks at the low-pressure end.

While others give their lives, what are you giving?



Counties Gas & Electric Company's 13,000-Volt Feeder Rack, Showing Many Safety Features of Interest.

SIGNAL FOR INDICATING WATTMETER SUPPLY.

Safety Measure to Safeguard Against Unnoticed Interruption of Potential in Meter Circuit.

By M. S. Montgomery.

It is now almost standard practice to employ potential transformers for instrument circuits employing voltages above 440, on the grounds of safety, simplicity and flexibility. In many cases the station layout is such that the instrument potential transformers (and current transformers) are far-removed from the instruments and switchboards; and in any case they are usually out of sight.

There are many ways in which the potential and energy may be accidentally removed from the instruments, wattmeters, power-factor meters and voltmeters. For example, the potential transformer fuse may blow, fall out or become loose; leads may break after becoming brittle or because burnt off, and many more such causes. When this occurs, voltmeters may indicate no potential when potential exists, resulting in mistakes and needless trouble, wattmeter registration is affected and conditions will become chaotic if not extremely hazardous to life, or resulting in loss of revenue.

Instrument Pilot Light Installed, One Per Phase, Below Ammeters.

The larger the number of circuits and panels existing in a power-house or substation, the greater the opportunity for a meter, unnoticed, to become inoperative because of interrupted potential; likewise the more numerous the jobs and the greater the variety of work entailing upon an operator, the less time available for watching the switchboard meters. Failure of meter registration may mean a very real loss in cases where energy is being sold from a central-station company's system.

A safeguard against cessation of instrument potential that has been employed in many instances consists of installing a lamp socket on the switchboard panel in which is inserted a small tungsten lamp, say, of 10 watts. These lamps are connected respectively each to the potential transformer secondaries. So long as the transformer secondary is alive, the lamps are lit, thus giving an indication that the meter supply is normal, in this way safeguarding meter indication and registration and saving concern on the part of the operator.

PROBLEMS IN DISTRIBUTION.

Empire State Gas and Electric Association Discusses Line Economies.

At a recent meeting of the Electric Section of the Empire State Gas and Electric Association held at Utica, N. Y., several distribution subjects were presented for consideration and these were discussed from the standpoint of conservation of material and labor.

The first subject discussed was the method of hanging transformers on poles. There was considerable difference between the standards of the various companies represented, some limiting the transformers hung on a single pole to one 30 kv-a. or two 10 kv-a., while others hang as many as three 25 kv-a. units on one pole. Wherever it is possible to construct multiple-pole racks for large transformers, it seemed to be the general practice to do so.

For double-arming poles the use of iron pipe spacers was preferred by the majority. In alley arm construction most companies use double braces for double arms. On account of the difficulty experienced in obtaining galvanized hardware it was suggested that black iron might be tried. It was the general opinion that galvanized hardware should be used and several instances of unsatisfactory experiences with black iron were cited.

In discussing the guying of poles, it was pointed out that drive or screw anchors could be installed at less expense than "dead men," and that they gave very satisfactory service. Some companies use various types of boltless guy clamps, but the general practice is to use three-bolt clamps.

The subject of economizing in the use of wire was discussed and it was found that a number of companies were reducing the minimum size of wire for services from No. 6 to No. 8 and, in some cases where multiple-conductor cable is used, to No. 10. It was felt, however, that the size of line wires should not be reduced below No. 6 for safety. Some representatives advocated the use of copper-clad steel wire where mechanical requirements would cause the use of larger copper than was necessary to carry the current.

Discussion of the design of secondary networks indicated that the member companies are studying transformer loads and grouping in an effort to reduce the number of transformers and to increase the load-factor on the line transformers.

CALCIUM CHLORIDE FOR METERS.

By A. McKnee.

Many electricians and most meter readers have doubtless met many instances where for some reason or another moisture insists on condensing upon the glass "window" of wattmeters of the integrating type or watt-hour meters. This seems to occur where the room in which the meter is installed is a comparatively cool place, where moisture enters the meter by "breathing."

Whatever the cause, which should be found and remedied whenever feasible, the writer has found it a simple matter to prevent the condensation. This is done by placing a small piece of calcium chloride in the meter. This absorbs the moisture, thus preventing it condensing upon the cold glass.

You are only asked to lend your money to Victory.

Can you do less than lend your dollars to Victory?

Contracting-Construction

Croft Concludes Series on Conduit Fishing — Some Kinks on Fishing and Substitute Brace—Among the Contractors

A FEW FACTS ABOUT CONDUIT FISHING.

Special Pneumatic and Mechanical Conduit-Fishing Machines and Their Operation.

By Terrell Croft.

[This is the last of a series of seven articles by this well-known author in which he describes and illustrates the best methods and equipment for fishing conduit. On account of the increasing use of conduit systems, this matter is steadily becoming more important, so that a discussion of the subject is of timely value. This series of articles began in the issue of Aug. 24, 1918.]

The Pneumatic Fishing Apparatus Manufactured by the Pneumatic Conduit Threader Company of 12 North 8th street, Richmond, Va., and shown in Fig. 27, utilizes the principles of the improvised outfit just described.* The pressure-developing rig consists of

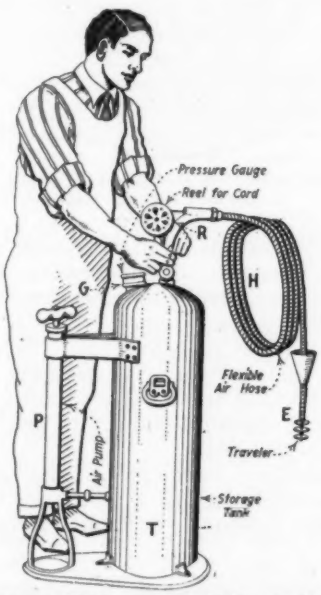


Fig. 27.—Air-Pressure Fishing Outfit Made by the Pneumatic Threader Company.

an air pump *P*, a storage tank *T*, and a pressure gauge *G*. A flexible air hose *H* is furnished which is inserted in the end of the conduit to be fished. The fishing cord winds on a reel *R*. On the end of the fishing cord is the traveler *E*, shown in detail in Fig. 28. This traveler consists of three thin disks or pistons mounted on a small longitudinal shaft and provided with a snap hook whereby the traveler can be attached to the eye in the end of the fishing line.

The general method of using this outfit is similar to that described in connection with Fig. 22.* It is claimed that the strong cord fishing line, which is provided with the outfit, is strong enough for drawing in ordinary conductors. Where large conductors or cables are to be handled, a pulling-in wire or line is first drawn (Fig. 29) into the tube with the cord fish line. The outfit weighs 40 lb. It is claimed that runs having a length of 150 ft. and containing 7 elbows have been fished with this outfit in a few seconds. It

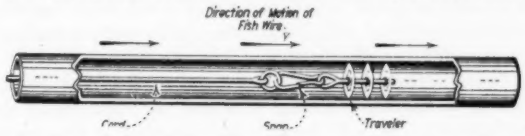


Fig. 28.—Pneumatically Impelled Traveler Pulling Fishing Cord.

is also effective for clearing conduits of minor obstructions, such as plaster fragments, chips and dirt by the application of pneumatic pressure.

Pneumatic Vacuum Fishing is not as effective as pressure fishing, but may often be employed to advantage where no pressure pump is available but a vacuum cleaner is at hand. The suction hose of the cleaner is placed over one end of the conduit to be fished and the fishing line, having on its end a cloth wad or a cork piston, is fed into the other outlet. The pressure due to the vacuum produced by the cleaner pump will pull the line through ordinary runs. The reason that the plenum method is the better is that with a good force pump and reservoir very high pressure can be produced. The production of an equivalent plenum is not possible with the vacuum pumps ordinarily encountered.

Conduit Fishing Machines which forcibly impel a fishing ribbon through the ducts have been used in certain cases. There is only one which is, to the writer's knowledge, regularly manufactured. This (Fig. 30) is the "National Conduit Wiring Machine." It is manufactured by the National Conduit Wiring Co., 25 Broad street, New York City.

The Principle of the National Fishing Machine is patented and is explained graphically in Fig. 31. It involves the winding of two steel tapes *B* and *T*. *T* is the tape which constitutes the fish wire and which is forced through the conduit. *B* is the winding tape. Both of these tapes are first wound on the lower spool

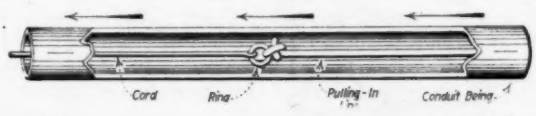


Fig. 29.—Pulling-In Line Drawn Into Conduit With Cord.

L. Tape *B*, which is fastened on the upper spool *U*, acts as a driving pulley and forces *T* out through the flexible armored hose *H* (Fig. 30) and into the conduit to be fished. The hose guides the tape from the machine to the conduit outlet.

The Operation of the National Machine may be described thus: The hose *H* is first thrust into the end of the conduit to be wired, as shown in Fig. 30. The

(Copyrighted, 1917. All rights reserved by the author.)
*See Electrical Review, Sept. 28, 1918, pages 509 and 510.

crank is placed on the upper reel shaft and turned at any desired speed. This operation winds the propelling tape *B* from the lower reel *L* onto the upper one *U*, thereby the fishing tape *T* is projected from the machine and through the conduit. The force, due to which the fishing tape *T* is projected, is directly proportional to that applied by the hand to the crank *C* (Fig. 31). It should be noted, however, that the force imparted to *T* at the machine is greater than that imposed on the crank handle because of the "leverage" due to the 12-in. crank operating on the 5½-in. wheel. After the fishing tape *T* has been propelled through the conduit to the required outlet, the insulated conductor, if the pull is to be a light one (or the pulling-in wire if the pull is to be heavy) is attached to the tape. Then the crank *C* is detached from the upper reel and attached to the lower one. Then on turning the crank both of the tapes are coiled back again on the lower reel and the insulated conductor or pulling-in wire is pulled back through the conduit.

The Performance and the Cost of Fishing with the National Conduit Fishing Machine is apparently quite satisfactory. When the crank is turned at the average speed the fishing tape is projected through the conduit at a velocity of 4 ft. per second. It is claimed that records of large installations involving a total of several million lineal feet of conduit show that the cost of fishing has been less than ¼ cent per lineal foot as against ¾ cent to 1 cent per foot for hand fishing. Two models are manufactured. Model *B* has a capacity of 150 ft. and model *A*, 250 ft. The machine weighs 32 lb. and is collapsible for transportation.

Why the National Machine Will Thread Difficult Runs is due, so the manufacturer claims, to the great force impressed against the fishing tape and to the greater velocity of the tape without any cessation of motion. It is understood that this machine will fish runs with a large number of bends which may be very difficult to fish by hand. It is claimed that a 100-ft. conduit run containing over 20 right-angle bends was successfully fished in a competitive test. It is explained that in hand fishing the operator can only

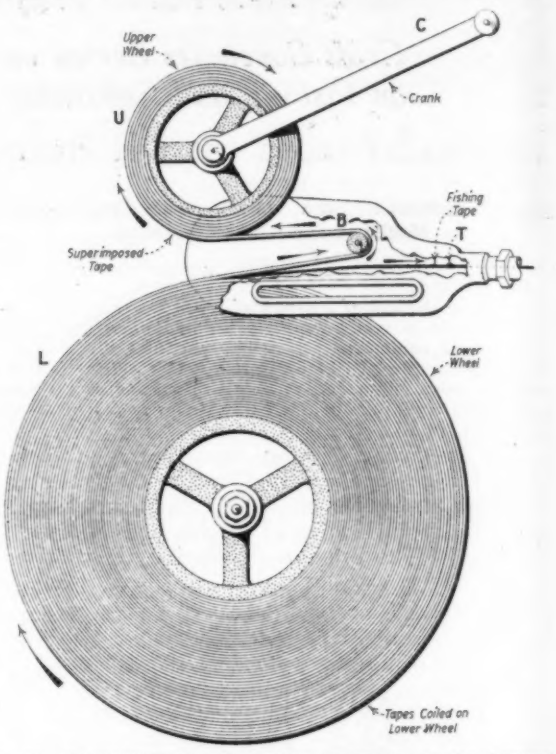


Fig. 31.—Illustrating the Operating Principle of the National Conduit Fishing Machine.

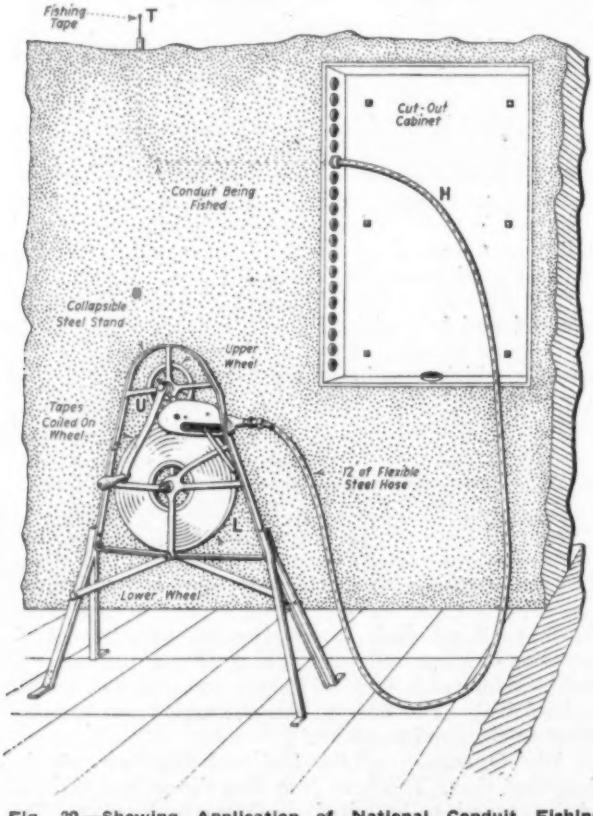


Fig. 30.—Showing Application of National Conduit Fishing Machine.

shove the fish ribbon into the conduit to the limit of the sweep of his arm. The movement of the tape must cease momentarily while he takes another hold. Each time his hold is thus changed there is a cessation of motion and a loss of momentum. When the tape is impelled by the machine it is constantly in motion, and hence the starting frictional resistance, which always occurs when anything subject to friction is started from rest, is nullified.

To summarize, then, the fact that the fishing tape of this National machine is constantly in motion at a high velocity appears to account for its excellent performance.

A TIME-SAVER IN FISHING WIRE.

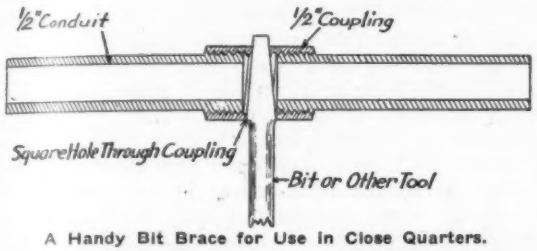
By B. C. Zimmerman.

Reading the articles on conduit fishing by Mr. Croft reminds me of a little kink that may save some of the readers of the Review a lot of time. Whenever a difficult job of fishing has been completed and it is suspected that, when pulling in the conductors, BX or loom, they may give way (as has happened on several occasions), I find it a very simple but good plan to tie a piece of strong string to the end of the fishing wire or tape, this string being pulled in along with the conductors. Now if these tear while being drawn in you will not have to fish all over again, but with the string can pull the fishing wire back. The same idea can be used when drawing in a pulling-in line, the string saving the time and labor otherwise required to fish all over again.

A SUBSTITUTE FOR BIT BRACE.

By J. A. Wever.

In old-house-wiring work it is often necessary to drill a hole in very close quarters and awkward positions where there is not sufficient room to manipulate a brace, as, for instance, when boring through the two-by-four plate over a partition on the upper floor of a house with scant headroom between ceiling and roof. In this case the bit is usually turned with a wrench, which often slips and chews up the bit shank. The tool handle shown in the sketch herewith is a decided improvement over a wrench and makes the task less tedious. It will also be found handy for holding the



A Handy Bit Brace for Use in Close Quarters.

pipe-burring reamer and similar tools. It is made from a half-inch conduit coupling and two short pieces of conduit. A hole is drilled through both walls of the coupling at the center and then filed square to fit the tang of the bit. These holes are made large enough to permit a portion of the tang to project above coupling, so that if it becomes wedged in tightly a tap with a hammer will easily remove it. The threads of the handles should work freely, for these handles when tightened also serve to clamp the tool.

FISHING WIRE MADE OF TWISTED PAIR.

By James Burns.

In Mr. Croft's interesting articles on conduit fishing I find that he refers mostly to the use of ribbon or round wire for the fishing tape or "snake." I have had considerable success with a kind of fish wire that he does not mention and which may be of interest. I take galvanized-iron wire, about twice as long as the length of the finished snake, and double it back, first placing a large nail or spike in the middle. This spike is put in the vise and the two loose ends of the wire are clamped in the chuck of a brace and by means of the latter the entire wire is twisted tightly so it resembles lamp cord or any twisted pair used in telephone work. Of course, this twisted pair is much stiffer than lamp cord because it's unstranded iron wire. It is flexible enough for fishing, however, and I believe better than ordinary fish tape because it remains straighter and does not coil or snarl up so readily.

AMONG THE CONTRACTORS.

Beaver Electric Co., Portland, Ore., is carrying through the installation of motors and lighting equipment in the boiler and machine shops of McDougall & Overmire in that city. The motors, of General Electric type, amount to 200 hp. in small units for direct-connected individual drive. This company has just completed the installation of 300 hp. in small motors in the new aeroplane plant of the Jeffery Aeroplane Co.; also complete lighting facilities. Another contract in hand consists of installing 250 hp. in General Electric and Allis-Chalmers motors in the new aeroplane addition to the Nicolai Door Co., Portland, for individual drive; also a contract for 100 hp. in motors at the new works of Western Foundry Co., to operate machines and a 4-ton electric crane.

G. Johnson & Son, of Kaukauna, Wis., are doing the electrical work in the new high school at Clintonville, Wis., the contract price for which amounts to $3450.

The Board of Supervisors of Niagara county, N. Y., has awarded a contract to the Dunlap Electric & Motors Co., 54 Pine street, Lockport, N. Y., for the installation of new electric lighting fixtures, etc., at the county institution.

In connection with the new two-story school building being erected by the Nicholson School District at Nicholson, Pa., at a cost of about $25,000, the contract for electric work has been awarded to Morris Hinkley, of Nicholson.

The Lancaster Electric Supply & Construction Co., Lancaster, Pa., has been awarded a contract for electric work in connection with the new two-story office building being erected by the Lancaster Iron Co. at North Queen and Chestnut streets, Lancaster.

The Bureau of Yards and Docks of the Navy Department has awarded a contract to W. G. Cornell & Co., Fourth avenue and Seventeenth street, New York City, for the installation of a new underground heating system at the Government station, Ward's Island, at $54,854.

The United Electric Construction Co., Philadelphia, Pa., is completing electric light and power wiring, amounting to some $40,000, on the Philadelphia municipal pier at the foot of McKean street. This pier is being used for the Federal Government and the work has been rushed as much as possible.

The Electro Construction Company, Commercial Trust Building, Philadelphia, Pa., has been awarded the contract for electric work in connection with the new railroad shop buildings being constructed by the Pennsylvania Railroad Company at its South Philadelphia yards at a cost of approximately $1,000,000.

A. H. Cox & Co., 307 First avenue South, Seattle, Wash., are making numerous installations of electrical equipment throughout the Pacific Northwest. An important job is that of installing all of the electrical and air equipment in the South Bend shipyards at South Bend, Wash., where a five-slip yard is being erected. The larger motors will be of the General Electric 2300-volt type, 3-phase machines, the smaller of standard type 440 volts. The yard will be well equipped for either wood or steel construction and the installation of air lines and compressor is nearly finished. The power will be furnished by the Willapa Electric Co. The entire installation is being handled by A. H. Cox & Co. in conjunction with the overhauling and repairing of the electrical equipment of the Kleeb Lumber Co., of South Bend, which is interested in the shipyards. The equipment in this mill was injured some time ago in a fire and is being shipped to Cox & Co. at Seattle for complete overhauling. The company has also completed installation of special motors and controlling apparatus for operation of the electric mangles at the Supply Laundry in Seattle. These machines have proven wholly satisfactory and other changes are contemplated.

BOOK REVIEWS

"Elements of Fuel Oil and Steam Engineering." A practical treatise. By Robert Sibley and Charles H. Delany. San Francisco: Technical Publishing Co. Cloth 320 pages (6x8⅞ in.), generously illustrated. Supplied by Book Department, International Trade Press, Inc., Chicago, for $3.

An important book on an important subject, a veritable *vade mecum*, alike suitable for the technical man or the practical worker desirous of self-improvement, ambitious of making himself worth more to his employer and himself. The book differs rather from the ordinary technical book, and that alone tends to make it worth while. It is a little less prosaic, less of the printed-to-order variety that is so apparent in many technical books.

The subjects of steam engineering and fuel oil and its combustion have been interestingly covered in 320 pages, comprising 33 chapters and three appendices. The chapters deal respectively with the modern power plant for fuel oil consumption, fundamental laws involved in fuel oil practice, theory of pressures, measurement of temperatures, elementary laws of thermodynamics, water and steam in fuel oil practice, steam tables in fuel oil practice, how to compute boiler horsepower, equivalent evaporation and factor of evaporation, how to determine quality of steam, steam calorimeter and its use in fuel oil practice, rational and empirical formulas for steam constants, fundamentals of furnace operation in fuel oil practice, the boiler shell and its accessories for steam generation, boiler classification in fuel oil practice, fuel oil and specifications for purchase, boiler room instructions for fuel oil burning, how to compute strength of boiler shells in fuel oil practice, furnaces in fuel oil practice, burner classification, the gravity of oils, moisture content of oils, determination of heating value of oils, chimney gas analysis, analysis by weight and air theoretically required in fuel oil furnace, computation of combustion data from Orsat analysis, weighing water and oil, measurement of steam used in atomization, taking of boiler test data, preliminary tabulation and calculation of test data, the heat balance and boiler efficiency, summary of suggestions for fuel oil tests and their tabulation, the use of evaporative tests in increasing efficiency of oil-fired boilers. The three appendices deal respectively with illustrative problems, conclusions and recommendations on petroleum for fuel purposes, helpful factors in fuel oil study and conservation.

The book is a happy blending of theory and practice, the authors a happy combination of professor and operator—a combination that one wishes would oftener get together in writing text books. The whys and wherefores have been given, a policy that simplifies difficulties, indicates the relation between theory and practice, and impresses upon the untrained mind facts not otherwise readily grasped. He who reads cannot fail to obtain a thorough rudimentary understanding of the fundamentals of steam engineering and oil fuel. The arrangement of the text so that the subjects of oil burning and steam engineering can be taken up either together or separately is obviously a desirable feature.

The subject is a worthy one, and one worthily treated by two men well able to do their subject justice. It gives the writer pleasure to read a book on such an important subject and of such timely interest, that largely describes apparatus and power plants which he has been privileged to visit.

I. L. KENTISH-RANKIN.

"Electrical Blue Book." Eighth Edition, 1918. Chicago: International Trade Press, Inc. Cloth, 274 pages (9x12 in.), illustrated. Supplied by International Trade Press, Inc., Chicago, for $2.

Earlier editions of the "Electrical Blue Book" have marked it as the reference book of the electrical industry for approved construction methods and materials. The present edition has therefore been looked forward to with considerable interest because, as usual, it includes the latest edition of the National Electrical Code, with explanatory notes and covering the revision of these important rules completed only a few months ago, besides a complete listing of inspected and approved electrical appliances, also other information of value to the buyers of electrical material.

The 1918 edition is composed of three principal parts, of which the first consists of some 150 pages of catalog exhibits of approved electrical fittings and appliances as produced by the leading electrical manufacturers. All these pages are well illustrated so as to give the reader an excellent idea of the products described. Both alphabetical and classified indexes aid in quickly finding producer or equipment desired.

In the second part is given an outline of the Underwriters' Laboratories Inspection Service, together with the list of the branch offices and stations, and followed by the complete latest list of inspected electrical appliances and material.

The third part consists of the complete National Electrical Code, 1918 edition, which is the first appearance of this latest Code with all the revisions indicated. This is done in this case by printing the new rules or changed parts of old rules in bold-faced type so that all interested in the changes may know just what they are. This is of great value to all electrical engineers, contractors and inspectors who must keep informed on the latest regulations covering construction practice. To pick out all the changes in the nearly 100 rules with their many sections is a laborious task which has been saved by the careful editing of the rules in the Blue Book. This has also included the correction of numerous typographical errors, both in the rules and index, appearing in the little booklet containing the Code as published by the National Board of Fire Underwriters. Moreover, the absence of much needed explanatory notes in this booklet has been met in the Blue Book by fairly copious notes, most of which are new. Quite a number of illustrations also help make clear the meaning of the rules. This part of the Blue Book alone makes it invaluable to all interested in the best electrical construction practice.

Additional matter appearing in the book is a list of members of the Electrical Supply Jobbers' Association, the national organization of this branch of the industry; a general directory of electrical associations; and a complete buyers' guide of electrical apparatus and material.

All told, the new Blue Book contains a mass of ready reference information for the buyer, installer and inspector of electrical construction material and appliances. No effort has apparently been spared to make this information as up-to-date and authentic as possible. The publishers are to be congratulated, therefore, on getting out under the stress of the most serious war conditions this excellent edition of the Electrical Blue Book at a price no greater than earlier and less complete editions.

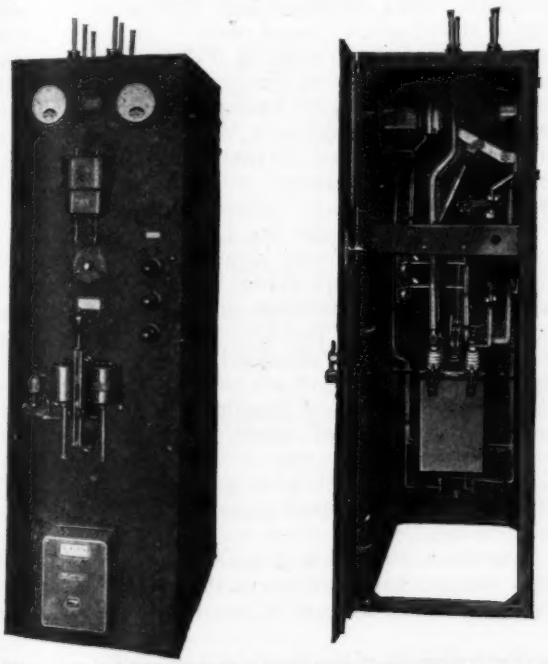
BERNARD J. DILLON.

New Appliances

Safe Switching Cabinet and Crane Panel—Portable Welder Set—Condenser Packing—Receptacles for Marine Service

SAFETY FIRST STEEL SWITCHING CABINET.

The new steel switching cabinet illustrated is a unit made for single-phase, two-phase and three-phase circuits in capacities up to 300 amperes at 15,000 volts, and 800 amperes at 600 volts. All current-carrying parts are inclosed and provision is made for bringing the leads out at top, bottom or sides of the unit. The cabinet consists primarily of instrument transformers, oil circuit-breakers and disconnecting switches



Safety Switching Cabinet for Three-Pole, 2500-Volt Oil Switch, Fuse Holders and Meters. Interior View.

inclosed in a sheet-steel compartment with instruments, operating levers, etc., mounted on the sheet-steel front.

The main switching apparatus consists of a standard switchboard-type oil circuit-breaker operated in the ordinary manner. The oil circuit-breaker is mechanically interlocked with the disconnecting switch so that this switch cannot be opened or closed while the oil circuit-breaker is closed. The disconnecting switch is operated by means of a special handle or wrench from the front of the panel, and is so interlocked that the rear door cannot be opened while the switch is closed, nor can the switch be closed while the door is open.

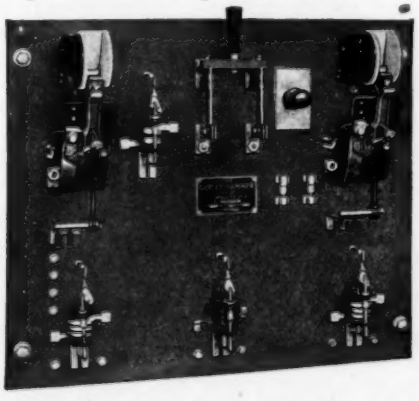
This apparatus has been designed to be used for distribution and tying-in switches or for control switches for induction and synchronous motors, etc. It is usually mounted as a single unit, but may be installed in groups if desired. When made with a drip roof the switch cabinet is particularly adapted to use in mines or other damp places. It can be made nearly water, gas and dustproof. It can also be used to control large motors in steel and cement mills, pumping plants, etc., where conditions often exist which cause the switching apparatus to become damaged and put out of service by dust or moisture or by mechanical interference from chains hanging from cranes.

These steel switching cabinets are manufactured by the General Electric Company, Schenectady, N. Y.

SAFETY FIRST PANELS FOR CRANES AND THEIR OPERATORS.

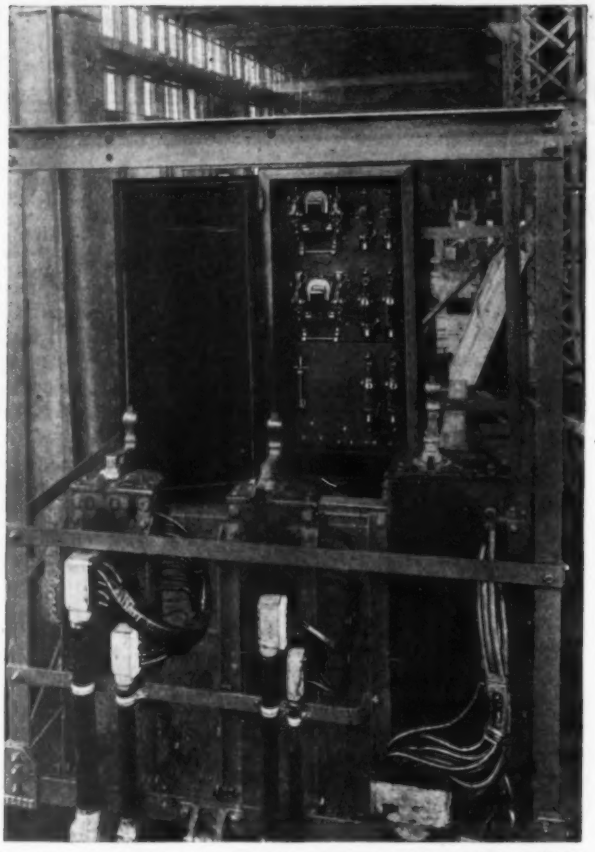
The average crane cab built a few years ago before the advent of "safety first" ideas, and even some cabs now manufactured give practically no protection to the motors and actually present hazards to the operator. Picture a cab of angle-iron and sheet-metal construction with not a great deal of headroom; a limited floor space with at least three controllers, the operator and his stool, then add to this a switchboard or panel mounted in the cab, with four or more exposed knife switches and fuses, and you have conditions which make an accident to the crane, or operator, or both, very liable. There is no end of things that might happen and probably have happened to cranes and operators, due to lack of electrical protective devices. By simply removing the dangerous open switchboard and installing in its place a crane protective panel (shown in the accompanying illustrations) mounted in a steel cabinet, all the danger of an electrical shock will be removed and assured protection given to the motors and operator.

These panels take the place of the various circuit-



Standard Direct-Current Crane Protective Panel for Use With Manually Controlled Cranes.

breakers, knife switches, fuses, etc., previously mounted in the crane cab, thus giving a complete switchboard on which are arranged all the necessary protective devices and safety features. No-voltage and overload protection is provided for each motor supplied through the panel, a thing hardly possible with the usual equipment. The control of the panel



Special Crane Protective Panel for Cranes Having Three Polyphase Motors. Panel Provides Two Inverse-Time-Element Overload Relays for Each Motor.

is obtained through a push-button station. The control circuit is so arranged that one clapper switch is closed when the "start" button is depressed and the other when the "start" button is released. In case an overload or ground condition remains, the first switch closed would be opened when the second switch is closed, thus obtaining the "non-closing on overload" feature.

To start the crane the operator merely depresses the "start" button for an instant before manipulating the motor controllers, this requiring far less time than closing numerous circuit-breakers and fuses. To shut off the power from all circuits, he touches the "stop" button. If he wishes to inspect any motor, or leave the crane temporarily in an inoperative condition, he can withdraw the safety plug and take it with him.

The direct-current crane panel shown in the smaller cut has all of the following apparatus: One double-pole single-throw knife switch, with means for locking the switch open by inserting one of two padlocks (one for the operator and one for the electrician); one main-circuit, automatic-reset overload relay on one side of the line; one automatic-reset overload relay for each crane motor and connected on the opposite side of the line to the main-circuit relay; two magnetically operated main-line clapper switches, one for each side of the line; one operator's safety plug which will open the control circuit when removed from the panel; and two inclosed fuses in the control circuit and terminal lugs for external connections to mains, motor heads, and control push-button stations.

The installation view shows a special alternating-current protective panel for three polyphase motors. Each motor has two hand-reset, time-limit overload relays, one in each of two phases, to protect the motors against overload. The two double-pole magnetic main-line switches open all three phases, the connections being so arranged to give double safety, for, should one switch become inoperative, the other would open two phases and stop the motor. These two switches are controlled from a push-button station placed near the operator. The single-pole knife switch shown in the lower left-hand corner of the panel is also connected in the control circuit, and may be locked open with an ordinary padlock to prevent accidental and unauthorized operation of the crane.

These protecting panels are made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., for cranes having either alternating or direct-current motors aggregating 50 to 400 hp.

A NEW TYPE OF PORTABLE ARC WELDER.

Although electric arc welding has been used for several years in the iron and steel industry, its use has mostly been confined to factories, repair shops and other locations where the work can be brought to the machine. The accompanying illustration, however, Fig 1, shows a new type of portable arc welder, which presents especially interesting features and is designed for operation where electric current is not available. It consists of a Lincoln 150-ampere arc welding generator direct-connected to a Winton G. L. 5 gasoline engine and is intended for mounting on an automobile truck or other convenient position so that it may be transferred from place to place.

Although at present the Lincoln Electric Co., of Cleveland, Ohio, is only supplying these sets to the Government for shipbuilding yards and other places where electric arc welding can be used to advantage on war work, it is probable that as soon as Uncle Sam's requirements are filled there will be a large demand for this type of arc welders for oil pipe lines boiler shops, large steel foundries, dry docks, etc., for advantages of greater speed, lower cost and better results are in most cases decidedly in favor of arc welding as compared with gas welding, brazing or riveting, especially where a portable outfit such as this one is available.

An interesting point in the construction of the Lincoln arc welding machine is the method adopted to insure a steady arc and a constant and readily con-

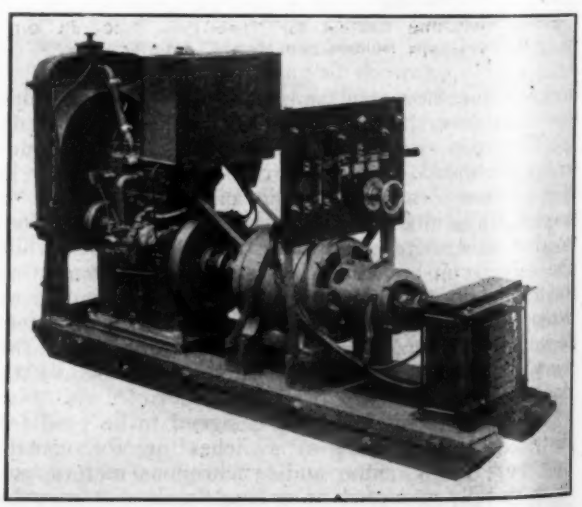


Fig. 1.—General View of Lincoln Arc Welder Showing Compact, Portable Method of Mounting.

trollable heat—the two greatest difficulties met with in the design of this class of apparatus. The voltage required to maintain a welding arc varies from 50 volts down to as low as 15 volts, where a metal electrode is used. The plan adopted by most makers to render the arc steady is to introduce sufficient "ballast resistance" in series with the arc to prevent excessive current being taken when the operator short-circuits the generator on "striking the arc." This method is exceedingly wasteful, more than three-quarters of the power generated being absorbed in the ballast resistance.

The Lincoln arc welder uses a compound-wound generator, the series winding of which is connected up so as to oppose the shunt field and the two windings are so proportioned that the voltage decreases in the same ratio as the current increases, thus limiting the short-circuit current. Another important effect of this is that the horsepower, and therefore the heat, developed for a given setting of the regular switch shown on the control board above the generator, in Fig. 1, remains practically constant.

It has been proven that a kilowatt-hour can be made to do four or five times as much work with the Lincoln welder than with machines using ballast re-

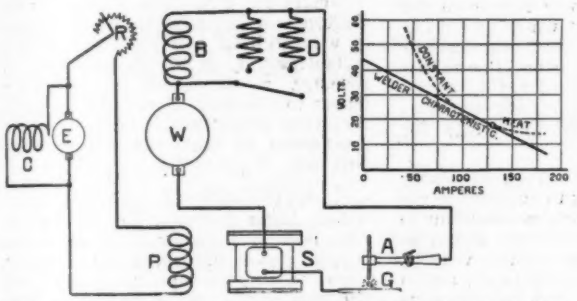


Fig. 2.—Wiring Diagram and Characteristic Curve of Arc Welder.

(A) Electrode Holder. (B) Series Field (Differential Connection). (C) Exciter Shunt Field. (D) Diverter Resistance. (E) Exciter. (W) Welding Generator. (P) Separately Excited Field. (S) Stabilizer. (G) Ground Plate. (R) Rheostat.

sistance. Additional arc stability is also insured by the stabilizer seen at the extreme right in Fig. 1. This is a highly inductive low-resistance coil connected in the welding circuit. It serves to correct momentary fluctuation of current in much the same manner as the flywheel of an engine produces an even turning speed.

FLEXIBLE METALLIC PACKING FOR CONDENSERS.

After several years actual use, The Crane Packing Co., 9 S. Clinton street, Chicago, announces it has found "John Crane" soft flexible metallic packing to be an excellent packing for use in condensers.

This packing is made of thin babbitt sheets, wrapped round and round spirally, lubricated between every layer and die-formed into rings. This produces a ring of exact size and removes all guesswork as to uniformity. The simplicity of installation is apparent. This pliable, metallic material under pressure of the gland completely seals the tube, yet allows freedom for the tube to slide. There is no expansion or contraction. No excessive binding. A tube can be removed without disturbing the packing, and the same packing may be used for sealing a new tube. Also, the packing centralizes the tube. To insure further against leaks, two or three rings, with joints staggered, are usually placed in each stuffing box.

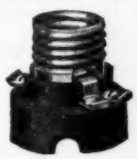
This packing is all-metallic, resists alkalies, acids, salts and chemicals in solution and is just as flexible and pliable years after installation as when new. This packing is equally valuable on evaporators and heaters, valve stems, etc.; in fact, wherever packing is required.

ELECTRICAL WIRING DEVICES FOR MARINE SERVICE.

Up to the time of the development of the large number of merchant ships under the jurisdiction of the Emergency Fleet Corporation, it had been common practice to adapt ordinary electrical wiring devices for use on commercial vessels. Standardization of ship design and manufacture consequently called for standardization of all necessary fittings. With the realization of this demand for standardized marine wiring

Key Lamp Receptacle.

Receptacle Shell Insulator.



Keyless Lamp Receptacle.

devices, the Bryant Electric Co., Bridgeport, Conn., has developed, after an exhaustive study of the specific requirements of the service, a line of sockets, switches, connecting blocks and other devices, which have been approved by the Emergency Fleet Corporation and which are of course National Electrical Code approved.

As will be noted from the accompanying illustrations, showing the key and keyless lamp receptacles separate, the shell insulator, the base and all nonmetallic parts are made of unbreakable molded com-

Keyless Receptacle Installed in 4-In. Box, Showing Use of Spare Terminals to Make Branch Circuits Without Soldered Connections.

position of liberal dimensions. There are grooves on the under side of the receptacle bases which permit of the convenient passing of separate circuit wires through the box. Double binding-screw terminals are provided so that taps can be taken directly off the terminal plate without requiring the usual soldered connections in the box.

The lamp-receptacle shell insulator shown is designed to eliminate the danger of exposed metal parts where the requirements of the service necessitate. It is listed and furnished as a separate piece. All metal parts are of brass or bronze with the exception of those elements which, because of their function, must necessarily be made of steel. Such parts as the ratchet plate, the escapement and the actuating spring, while of steel, are heavily copper-plated to prevent rusting.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

WESTMORELAND, N. H.—Cheshire County Commissioners have commenced the construction of a one-story boiler plant, about 40x60 feet, at the county institution, Westmoreland.

NEWPORT, R. I.—The United States Government, Bureau of Yards and Docks, has awarded a contract for the installation of an electric distribution system at the local naval station, to cost $43,000.

ARGYLE, N. Y.—Bonds have been authorized for the construction of municipal light plant. Address L. C. Barkley, village clerk.

AUBURN, N. Y.—Empire Gas & Electric Co. has been ordered to discontinue the operation of its power plants on the Barge Canal Locks, effective September 27. The order issued by W. W. Wotherspoon, Superintendent of Public Works, stipulates that the plants must be shut down until the water level reaches the established 445 feet above sea level. These plants comprise the main generating stations of the company, and have been furnishing service to many important industries in this vicinity, including the International Harvester Co., Columbian Rope Co., Bowen Manufacturing Co., and others, with territory extending from Auburn to Seneca Falls, Geneva, Waterloo, and Lyons. During the interruption in full service, it is understood that the company's auxiliary plant and system will furnish service exclusively to munition plants in this territory.

BUFFALO, N. Y.—The City Council is negotiating with the Buffalo General Electric Co. for the renewal of its contract for supplying service for the operation of its magnetite and luminous arc lamp street-lighting system.

GENEVA, N. Y.—Contract has been awarded by the City Council for the erection of the proposed two-story boiler plant, about 40x48 feet. T. J. Wright, High street, Geneva, is the contractor; W. G. Fraser, 102 Clinton street, Buffalo, is engineer.

MARTINSBURG, N. Y.—Hirschey & Lewis have petitioned for authority to construct an electric light plant.

TOTTENVILLE, S. I., N. Y.—The United States Government is said to have completed arrangements for financing a loan to the Richmond Light & Power Co., approximating $600,000, for extensive additions and extensions in its power plant and system.

NEW YORK, N. Y.—New York Electric Lamp Co., 253 Fifth avenue, has leased additional space in the building now occupied to provide for extensions.

AMPERE, N. J.—Crocker-Wheeler Co., manufacturer of motors, generators, etc., has had plans prepared for alterations and improvements in its plant.

BLOOMFIELD, N. J.—Sprague Electric Works of the General Electric Co. has had plans prepared for the construction of a brick and steel power plant, about 90x190 feet, estimated to cost $100,000.

CAPE MAY, N. J.—The United States Government, Bureau of Yards and Docks, has had plans prepared for the installation of electrical distribution system, electric wiring, etc., at the local naval base (specification 3386).

DOVER, N. J.—New Jersey Power & Light Co. has recently completed the construction of an extension to its 11,000-volt transmission line and an 11,000-volt substation to connect with the plant of the Atlas Powder Co., a distance of about one mile, for the purpose of furnishing electric energy for operation.

GLOUCESTER CITY, N. J.—Pusey & Jones Co. is rushing to completion the erection of the large new power plant to supply electric energy for the operation of its shipbuilding plants in this vicinity. The structure is one-story brick, and it is planned to install five boilers, with economizers, stockers, superheaters, and auxiliary equipment. Power for operation is now being furnished by the Public Service Electric Co.

JERSEY CITY, N. J.—Mallinckrodt Chemical Co., West Side avenue, has commenced the construction of the proposed addition to its boiler plant, to cost $5000. George H. Wells, Jr., 120 Boyd avenue, Jersey City, is the contractor.

NEWARK, N. J. — Incandescent Products Co. has filed notice of organization to operate at 357 Ogden street to deal in incandescent lamps, etc. M. C. Jamieson, 157 Roseville avenue, heads the company.

ROCKAWAY, N. J.—Empire Steel & Iron Co. is planning for the immediate installation of an electric turbine unit in the power plant at its works at Mt. Hope.

SUMMIT, N. J.—Commonwealth Electric Co. has been granted permission by the Board of Public Utility Commissioners to issue stock for $6000 and first mortgage five per cent certificates for $22,000, the proceeds to be used, in part, for extensions.

TRENTON, N. J.—The electric motors, electrically-operated centrifugal pumps and auxiliary equipment, contract for which was recently awarded to William R. Thropp & Sons Co., East State street, Trenton, will be installed at the Bordentown municipal water works. In connection with this installation the City Commission, Bordentown, has arranged with the Public Service Electric Co. for the construction of a line to the plant to furnish service for operation. This installation is being made to eliminate the former steam-operated station owing to the present coal situation and to provide for greater efficiency in continuous operation.

ALTOONA, PA.—Pennsylvania Railroad Co. is planning for extensive additions to its Altoona and Juniata shops, to provide for increased capacity. Included in the plant is the erection of a large power plant at South Altoona to house two 5000-kw. generators and auxiliary equipment. The project is understood to involve an expenditure of over $1,000,000.

MILTON, PA.—The United States Government has authorized the erection of a large local power plant, to cost, it is understood, in the neighborhood of $300,000, to be used for furnishing power to the plant of the Milton Manufacturing Co., which is engaged on the production of shells for the War Department.

NORTHAMPTON, PA. — Lehigh Valley Light & Power Co. has recently completed the construction of a high tension power line through various sections of the borough to connect with the lines of the Lehigh Navigation Electric Co. for the purpose of supplying power for the operation of various plants in the vicinity engaged on Government contract work.

PHILADELPHIA, PA.—American Insulating Company has awarded a contract for the construction of a building, one-story, brick and concrete, about 25x80 feet, to be located at Roberts avenue and Stokley street. The William Steele & Sons Co., 30 South Fifteenth street, is the contractor.

PHILADELPHIA, PA.—Philadelphia Electric Company has made application to the Capital Issues Committee for permission to issue stock to the amount of $8,000,000, to be used, it is understood, for extensive additions to provide for increased operations.

SUNBURY, PA.—The Borough Council has called a special meeting to put to a vote of the people the purchase of the plant of the Northumberland County Gas & Electric Co. The project is estimated to cost $225,000.

ALBANY, GA.—Albany Power & Manufacturing Co. plans development to double its present facilities for generating electricity. The company now develops 4000 hp. and has 70 miles of transmission system. Plans include connection with the Columbia Power Co., 70 miles from Albany, and the erection of a 4000-hp. hydroelectric plant.

CORNELIA, GA.—Wofford Shoals Light & Power Co. is considering a bond issue for $50,000, the proceeds to be used, in part, for extensions and improvements.

NORTH CENTRAL STATES.

COLUMBUS, OHIO.—$30,000 in bonds have been authorized for the purchase of transformers for the municipal light plant and for installing nitrogen street lines throughout the city. Address city electrician.

DEFIANCE, OHIO.—Defiance Gas & Electric Co. is planning for the installation of a 3000-hp. unit at the central station, to provide for increased power facilities.

STRONGHURST, ILL.—Western Illinois Utilities Co. has petitioned for franchise to construct and operate an electric service system. Address President Kershaw of the Village Board.

MILWAUKEE, WIS.—The mayor has petitioned the United States authorities for permission to issue $200,000 in bonds for installing 1,500 lights in the municipal system before winter. Daniel W. Hoan, mayor.

EARLHAM, IOWA.—Madison County Mutual Rural Electric Co. has been granted franchise to build transmission line. M. A. Tharp is interested.

FORT MADISON, IOWA.—Atchison, Topeka & Santa Fe Railway Company will build an electric power plant here.

JOPLIN, MO.—A tentative contract was entered into by the city and the Empire District Electric Co. whereby the company is to furnish the city electric power for lighting purposes for the streets and city buildings and furnish power to those customers now supplied by the municipal electric plant east of Joplin.

ST. LOUIS, MO.—Oliver Electric Manufacturing Co. has awarded a contract to Amber & Zimmerman, 1228 Pine street, St. Louis, for the construction of a two-story plant, about 90x175 feet, estimated to cost $30,000.

ABILENE, KANS.—At a special election a 20-year extension in its franchise was voted the Riverside Light, Power & Gas Co. The company furnishes electric current to 32 towns.

ELLIS, KANS.—Electrical improvements to cost $30,000 are contemplated by the city. Work includes power house addition, brick smoke stack, 100 feet high, 5 feet in diameter, and generator set; brick and concrete building, one story, awarded to Antone Jacobs, Hays, Kans. Bids are being taken on smoke stack to close at an early date. Bids will soon be taken for the machinery.

KIRWIN, KANS.—The City Council met in extra session with Mr. Bent and Bert Hall of Phillipsburg to investigate the proposition of the Phillipsburg Electric Light & Power Co. to furnish Kirwin with electricity. The city has entered into a contract for three years with this company to furnish it electricity.

SOUTH CENTRAL STATES.

BLACKEY, KY.—G. D. Ison, of Blackey, and associates, are considering plans for the establishment of a local electric light plant.

GADSDEN, ALA.—Plans have been completed for the electrification of the municipal waterworks. Three large pumps, five motors, and auxiliary equipment will be installed.

MOBILE, ALA.—Mobile Electric Co. has had plans prepared for extensive improvements at its plant to provide for increased power facilities for the furnishing of electric energy to the nearby shipbuilding plants and other war industries for operation. The work includes the installation of automatic stoker equipment, the construction of new lines, etc., the improvements being estimated to cost $50,000.

DEQUEEN, ARK.—Commonwealth Public Service Co. purchased electric light and ice plants and are planning to make improvements.

MANSON, ARK.—Manson Mercantile & Gin Co. is said to be planning for the installation of a power plant and cotton-gin equipment to cost approximately $16,000.

MENO, OKLA.—Public Service Co., Muskogee, has been awarded a contract by the Borough officials for the operation of the electric street-lighting system. The company has acquired the local electric-light plant at DeQueen, and is said to be planning for improvements to increase operations.

OKLAHOMA CITY, OKLA.—Oklahoma Gas & Electric Co. has had plans prepared for the construction of a high-tension electric transmission line from El Reno to Hennessey.

GRANBURY, TEX.—The plant of the Granbury Ice, Water, Light & Power Co. has been destroyed by fire. Loss, $20,000; insurance, $6,000.

WESTERN STATES.

LOS ANGELES, CAL.—The Public Service Commission has awarded contract for the installation of a complete hydroelectric generating system to be installed in the power house at Haiwee, on Owens river, to Archer & Baldwin, 114 Liberty street, New York, N. Y., at $31,500.

EVERETT, WASH.—It is announced that the Pacific Coast branch of the Fordson Tractor Co. will be located in Everett. This plant will employ about 8,000 people and means a tremendous increase in Everett's population. Considerable electric power will be used.

TACOMA, WASH.—The United States Shipping Board Emergency Fleet Corporation has loaned the city of Tacoma $237,000 to be used for double-tracking its car lines to the shipyards, the purchase of new street cars and the construction of a new loop line within the city.

TACOMA, WASH.—The United States Government has approved an issue of $300,000 in bonds for the purpose of acquiring the Lake Cushman power site for the city of Tacoma.

DATES AHEAD.

American Electric Railway Association. Annual meeting, Atlantic City, N. J., October 8 and 9. Secretary, E. B. Burritt, 8 West 40th street, New York City.

Illuminating Engineering Society. Annual convention, New York City, October 10. General secretary, Clarence L. Law, Irving place and 15th street, New York, N. Y.

Jovian Order. Annual convention, Dallas, Texas, October 24-25-26. Mercury, Ell C. Bennett, 1415 Syndicate Trust building, St. Louis, Mo.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kans.

FOREIGN.

CITY OF MEXICO, MEXICO.—Negotiations have been in progress for some time between the British owners of the electric light and power system and the street railway lines of this city and the Federal Government looking to the return of the properties to the owning and operating companies. The Government took over the holdings of the City of Mexico Electric Light & Power Company and the Federal District Traction Company some time ago.

SANTA ROSALIA, STATE OF CHIHUAHUA, MEXICO.—Mexico Northern Power Company, which is composed of Canadians, is preparing to resume the construction of its hydroelectric plant on the Conchos river, near here. More than two million dollars were expended in the construction of a dam across the river and an additional three million dollars are to be spent in installing the electric power plant and constructing a power transmission system to the different cities and mining districts within a radius of 150 miles of here. At the time the construction work was interrupted by revolutionary troubles the company had entered into contracts for furnishing many mines and other industries with electric power at a low rate. Besides the electric power feature of the project it is purposed to reclaim about two hundred thousand acres of rich land in the valley of the Conchos river by means of irrigation. The water supply will be obtained from the large reservoir created by the dam.

INCORPORATIONS

ABERDEEN, S. DAK.—Farmers Electric Light Company has been incorporated with a capital of $25,000 by Fred P. Tosch.

NEW YORK, N. Y.—Beatrice Electric Company. Nominal capital, $5,000. To manufacture electric goods. Incorporators: F. M. Stackman, W. E. Lamboen, and B. M. Johnson, 1245 Putnam avenue, Brooklyn.

MORRIS, N. Y.—Morris Light & Power Corporation. Capital, $10,000. To operate a local plant for the generation and distribution of electric energy. Incorporators: H. and E. C. Linn, and G. Whitman, Morris.

SOUTHPORT, N. C. — Southport Electric Light & Power Company. Capital, $30,000. To operate a local plant for the generation and distribution of electric energy. Incorporators: William M. Bellamay, G. W. and E. M. Muppleyea, Southport.

JAMESTOWN, N. Y.—Jamestown Telephone Corporation. Capital, $750,-

000. To operate a telephone system. Incorporators: J. H. Wright, W. J. Maddox, and M. R. Stevenson, Jamestown.

BROOKLYN, N. Y.—Acorn Insulated Wire Company. Capital, $300,000. To manufacture electrical wire, etc. Incorporators: F. and W. R. Prosser, and W. George, 102 Dean street, Brooklyn.

DOVER, DEL.—The Colonization Coal, Coke & Power Company. Capital, $200,000. Incorporators: W. I. N. Lofland, F. Jackson, and G. W. Morgan.

EASTLAND, TEX.—Eastland Light & Power Co. has incorporated with a capital of $150,000 by W. B. Monsen, P. A. Rogers and R. Van Campen.

DURAND, ILL.—Citizens' Utilities Co. has incorporated with a capital of $5,000 by Henry Graham, W. E. Johnson and others.

BARRETT, MINN.—Barrett Rural Telephone Co. has incorporated with a capital of $5,000. Address Aug. Miller.

BRAINERD, MINN. — Brainerd Southern Rural Telephone Co., Inc., has incorporated with a capital of $7,500. Address John H. Webber.

CRAIG, MO.—Bigger Electric Company has incorporated to establish an electric light plant.

WOODSTON, KANS. — Woodston Light & Power Company has been chartered with a capital stock of $10,000 by Frank Shutts, Fred Shutts, and E. C. Parmer.

CHARLESTON, S. C.—Charleston Electric Service Company incorporated with the capital of $20,000. Address L. A. Edwards and Augustine T. Smyth. INC

PRESTONBURG, KY. — Eastern Kentucky Service Company has incorporated to establish an electric light plant. Address O. H. Stumbo.

NEWARK, N. J.—Luthy Storage Battery Company. Capital, $700,000. To manufacture storage batteries. Incorporators: James A. Burke, Summit; A. P. Nelson and William Hughes, Newark.

CAMDEN, N. J.—Beaumont Manufacturing Company. Capital, $60,000. To manufacture electrical appliances. Incorporators: R. H. Beaumont, H. E. Birch and E. A. Thumlert.

NEWARK, N. J.—A. P. Munning & Company. Capital, $500,000. To manufacture electrical apparatus. Incorporators: Julian A. Gregory, 84 Carleton street, East Orange; and John G. Daniel, 40 Clinton street, Brooklyn, N. Y.

COLLIERSTOWN, VA. — Rockbridge Mutual Telephone Company. Nominal capital, $5,000. To operate a local telephone system. Incorporators: Alfred McCordle and W. A. Tribbett, Jr.

BIRMINGHAM, ALA. — Domestic Electric Company. Capital, $10,000. To manufacture electric appliances. Incorporators: F. K. Runyan and William C. Knoph, Birmingham.

NEW YORK, N. Y.—Colorado Light Manufacturing Company, Inc., a Colorado incorporation, has filed notice of authorization to operate in New York for the manufacture of radio luminous compounds and kindred specialties, with a capital of $10,000. E. D. Davis, 558 West 158th street, has been appointed local representative.

DURAND, ILL.—Citizens' Utilities Company has incorporated with a capital of $35,000. The incorporators are Henry Graham, J. M. Best and others.

NORWAY, IOWA.—Norway Telephone company has incorporated with a capital of $22,000. Incorporators: James Harrington, W. A. Riley and others.

SPRINGFIELD, MO.—Articles of incorporation have been filed by the Page Battery Company, capitalized for $5,000. F. C. Page and Warren L. White constitute the board of directors. The corporation will buy, sell, lease, repair and charge electric batteries, buy and sell automobiles and other vehicles, etc.

NEW YORK, N. Y.—The Langer Water Power Extracting Company. Capital, $100,000. To manufacture power plant apparatus, etc. Incorporators: T. Howard, M. Langer, and M. Wyner, 1970 Mapes Avenue, New York.

NEW YORK, N. Y.—The U-Need-It Dry Storage Battery Company. Capital, $75,000. To manufacture electric batteries. Incorporators: E. L. Creighton, A. H. Jacobson, and J. J. Friedman, 966 Hoe Avenue, New York.

NEW YORK, N. Y.—The Ryan Manufacturing Company. Capital, $10,000. To manufacture automatic motor cut-out switches, etc. Incorporators: W. S. Ryan, D. J. Dowling, and C. S. Ashley, 15 John Street.

BUFFALO, N. Y.—Nash Buffalo Corporation. Active capital, $78,750. To manufacture and deal in motors, etc. Incorporators: A. E. Skinner, M. B. and C. B. Warre, 255 West End Avenue, New York.

HOBOKEN, N. J.—The New Jersey Machine Corporation. Capital, $50,000. To manufacture motors, dynamos, and kindred apparatus. Incorporators: M. Gailbert, New York; Martin Feybusch, Sea Cliff, N. Y.; James D. Reifsnyder, Weehawken, and William B. Devoe, Upper Montclair, N. J.

NEW PUBLICATIONS

SAFETY FOR THE HOUSEHOLD.—The Bureau of Standards, Washington, D. C., has issued Circular 75, entitled "Safety for the Household." This is a book of 127 pages with numerous illustrations which contains a mass of information that every householder should possess. It is written in a popular style and aims to emphasize the seriousness of certain risks frequently occurring in or about the home, also to give simple methods to protect life and property from such hazards and to stimulate general interest in public measures to provide safety for the household and the community. The book deals particularly with hazards of a somewhat technical character, such as those due to the use of electricity, gas, oils and other inflammable materials and chemicals. The chapter on electricity comprises about 34 pages and contains much valuable information that will minimize the dangers from shock. A separate chapter of eight pages deals with lightning and lightning protection. The remainder of the book is devoted almost entirely to the hazards due to the use of gas and various inflammable materials, both as to danger of asphyxiation and fire. There is also included valuable information in regard to miscellaneous hazards, such as falls, cuts and bruises, scalds and burns, etc. This valuable publication can be procured through the Superintendent of Documents, Government Printing Office, Washington, D. C., for 15 cents.

JOURNAL OF THE PATENT OFFICE SOCIETY.—The Patent Office Society, Washington, D. C., has begun the publication of the above journal, providing for the publication of the lectures given for the benefit of the assistant examiners. In this journal will be published from time to time certain proceedings and actions of the society to record progress in the attainment of its objects and results accomplished by affiliated societies affecting the patent system, also advance programs of meetings, lectures, etc., given under the auspices of the society. It is hoped to make the journal a forum for the presentation and discussion of legal and technical subjects relating to the useful arts, and a medium through which a wider knowledge of the workings and advantages of the patent system may be gained by inventors and manufacturers. The first edition, dated September, contains an article entitled "Thomas Jefferson and the Patent System," by William I. Wyman, also "Relation of the Examiner to the Inventor and His Attorney," by F. W. H. Clay, "Rules 1 to 16, Inclusive," by A. D. Merritt, and "Rules 17 to 23, Inclusive," by H. C. Armstrong, examiner. The Patent Office Society, with offices at 1315 Clifton street, Washington, D. C., will publish the journal monthly, and the subscription price thereof is $2.50 a year.

PROPOSALS

TRANSFORMERS.—Bids will be received by the Board of Public Service Commissioners, 1002 Knickerbocker building, Los Angeles, Cal., until Oct. 8 for high-voltage transformers, for the department in accordance with specifications No. 0-181.

MOTORS.—Sealed proposals will be received at the office of the Post Office Department purchasing agent, Washington, D. C., until 2 o'clock p. m., Oct. 7, 1918, for three electric motors, alternating current, ⅓ hp., 110 volts, 40 cycles, approximately 1,200 r.p.m. Motors to be equipped with 6-inch crowned pulleys 1½ inches wide; but if the speed of the motor differs from that specified, the pulleys should be changed accordingly to obtain the desired speed; 94 rheostats suitable for ⅓ hp., 110-volt direct-current motors; 41 rheostats suitable for ⅓ hp., 220-volt, direct-current motors.

HEATING SYSTEM.—Until Oct. 8, the Superintendent of Public Works, Albany, N. Y., will receive bids for the installation of a heating system in the terminal freight house on Pier 1, Erie Basin, Buffalo. W. W. Wotherspoon, Superintendent of Public Works.

Trade Activities

Consolidated Utilities Corp. Exhibits Farm Lighting Plants —Link-Belt Drive Installed in Government Spruce Mill

Electric Furnace Company of America, Alliance, Ohio, has purchased property in Salem, Ohio, and the removal of the company to that city is for the purpose of securing a building adapted at once to its growing needs. The company will move its plant very shortly, and the present working force of 60 will be increased, it is understood, to 200 or 300 men, who will be engaged in filling Government and other orders for melting furnace equipment.

Larner-Johnson Valve & Engineering Company, Philadelphia, Pa., has issued a very interesting bulletin dealing with the Johnson hydraulic valve. It defines clearly the primary function of a valve and tells of the many interesting and useful applications of the Johnson valve in hydraulic work apart from its principal function as a stop valve. The construction and principle of operation are shown diagrammatically and the many splendid features of this product, such as its strength, durability, reliability of operation, automatic closing, measurement of flow, etc., are pointed out. The bulletin contains numerous illustrations, showing installations of the Johnson valve, a list of some prominent users, as well as much valuable information on the subject.

Austin Co., industrial engineer and builder, Cleveland, Ohio, has ready for distribution "The Austin Book of Buildings" (No. 5), a 64-page volume, which completely covers the scope of the Austin service. A perusal of the index shows the following well defined departments of this new catalog. Starting with a definition of "The Austin Method," its chapters cover the ten Austin standards building units, railway standard units, combinations of Austin standards, specifications, the Austin industrial building service, its equipment service and export service. It also includes a long list of owners of Austin-built buildings and a full explanation of the way to use Austin service to save time. More than a half-hundred of beautiful illustrations of interiors and exteriors are to be found on its pages. Some are illustrations of the Austin standards without special architectural features, others show how it is possible to adapt a standard proposition like the Austin Company's to special requirements. Different architectural details are shown to be easily met whether for one building as in the case of the Dayton (Ohio) Metal Products Company or a large group of buildings as in the case of Nela Park (the National Mazda Lamp Works at Cleveland), where the architects' specifications were fully and satisfactorily met. The Nela Park group is worthy of particular mention, for it includes an engineering building, sales building, administration building, research laboratory, working building, power house, garage, purchasing and service buildings. Detailed drawings of all cross-sections, floor plans, side elevations, front elevations, etc., are given. Also full specifications for each standard, the exact uses for each type of building, as well as their adaptability to crane service. Of particular interest are the full-page illustrations of attractive Austin interiors and exteriors.

Industrial Electric Furnace Company, Chicago, Ill., maker of the Snyder electric furnace, is installing a five-ton furnace in the plant of the Zimmerman Steel Co., Bettendorf, Iowa. It is a three-phase furnace, designed for acid operation, and will be used for general work. C. H. Atherton, manager of the Zimmerman Steel Co., ordered the installation to replace the converter which his company had been using.

Herman A. Holz, Metropolitan Tower, New York City, is sending out to those interested in the investigation of magnetic materials, a circular describing the magnet meter. This is an instrument for the precise and convenient measurement of the magnetic qualities of permanent magnets. The instrument is compact and adapted for rapid as well as very accurate work. The circular illustrates and describes the instrument in detail. Another circular describes the Fahy simplex permeameter.

Consolidated Utilities Corporation of Chicago, manufacturer of lighting plants for country homes, farms, and garages, has on exhibit at the National Truck, Tractor and Accessories Exposition, four different models of electric lighting plants in actual operation, fully connected up with all of the appliances used on the up-to-date farm. This exhibit shows how the modern farm is run by electricity; not only has the farmer the same conveniences as the city man with lights in his house, barns and out-buildings, with an electric fan on the table, but the housewife does her washing and ironing by electricity, operates the churn and cream separator, sweeps her carpets by electricity; and has running water exactly the same as in the city home. Farmers representing many states in the union have already placed advanced orders for a new plant which the firm exhibited for the first time, named the "Little Husky." This plant will fully light and furnish power for the average sized farm. It is automatic, starts and stops itself, without even a button to press. Not only is the Consolidated plant a luxury on the farm, but a permanent improvement. The electrical dealers are finding the farm lighting business a very profitable one, it is an article for which the demand has already been created.

General Electric Co., Schenectady, N. Y., has leased the Sandusky plant of the Libbey Glass Co., of Toledo, Ohio. This plant, given over to the manufacture of electric lamp bulbs for incandescent lamps exclusively, produces bulbs at the rate of 175,000 per day by the machine process.

Harvey Hubbell, Inc., Bridgeport, Conn., is sending out a perforated leaflet covering trade discounts on Hubbell material, such as sockets and socket receptacles, shade holders, lamp guards, locking lamps, toggle switches, etc., and supercedes all previous discount lists.

Holophane Glass Co., with main offices at 340 Madison avenue, New York City, has arranged to erect a steel, reinforced concrete building at its glass works near Norwalk, Ohio. This building will be 150 by 40 feet. Other improvements in the plant will involve an expenditure of about $50,000.

Hamilton - Beach Manufacturing Co., Racine, Wis., is reported to be negotiating with the War Department for a large Government order, and there is a possibility that its entire plant will soon be devoted to Government work exclusively. If this action is taken, the company will discontinue its present line of work until after the war. The Hamilton-Beach plant is one of the best equipped factories in the country for light work, such as cartridge clips, fuses, etc., and is fitted with the most modern machinery and capable of a very large output of this class of Government work.

Link-Belt Co., at Portland, Ore., is furnishing the necessary silent chain drive for the motors to be installed in the Government spruce mill at Toledo, Ore., and 5000 ft. of conveyor chain; also, 3000 ft. of similar chain for the spruce cut-up mill at Vancouver, Wash. The conveyors are for the transfer of spruce material and the handling of refuse. This company is also furnishing the silent chains for motor drive in the municipal grain elevator at Portland.

Rathbone, Sard & Company, Albany, N. Y., recently issued a booklet illustrating and describing Acorn electric ranges. Since the necessity of conserving all resources has been so strongly emphasized, electric cooking has become increasingly popular. In addition to the many advantages afforded by this method, a great saving in food, fuel and time is effected. The booklet describes in detail eight types and sizes of ranges and presents in a very comprehensive manner the features of this excellent line. Fifteen war-time cooking suggestions by Alice Bradley, to aid the food conservation program of the nation are included.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

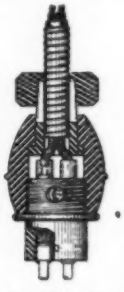
A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Armature Constructions (1,275,195).—A novel arrangement of wish-bone loops as conductors on an armature is described by Vincent G. Apple, of Dayton, Ohio.

Filling Storage Batteries (1,275,261).—For supplying liquid to secondary batteries, Miller Reese Hutchinson (according to this patent assigned to the Edison Storage Battery Co.) provides receptacles connected by valves which simultaneously feed a fresh supply into one chamber while emptying another into the battery cell.

Ignition Generator (1,275,292).—In the dynamo designed for ignition and lighting purposes by Alfons H. Neuland, of San Francisco, a laminated core carries a high-tension ignition winding, while the pole pieces carry a low-tension winding arranged in electrical space quadrature to the winding on the core.

Electrical Connector (1,276,216).—Instead of knotting a cord and depending on the knot to relieve the cord of mechanical strains tending to



No. 1,276,216.—Cord-Strain Relief for Connector.

pull it out of its connections, Ellsworth A. Hawthorne (of Bridgeport, Conn.) passes the cord through a split bushing and screws a nut on this bushing to clamp the latter on the cord.

Lighting and Ignition Generator (1,276,085).—A unitary field structure is used in the generator designed by Leon J. Le Pontois (of Lakewood, Ohio) for producing both a low-voltage direct current and a high-tension ignition current. The patent was assigned to The Teagle Company, of Cleveland, Ohio.

Electric Hammer (1,276,104).—A commutator block moves with the solenoid of the electromagnetic hammer patented by George M. Painter, of Chicago, but also can move independently to a limited extent. Then he provides means for shifting the commutator at the ends of the path of travel of the core, so as to reverse the magnetic field and cushion the stroke.

Anchor Rod (1,276,021).—The ground anchor rod of William R. Brashear (of Dayton, Ohio) is so interlocked with the anchoring plate that it can be detached from the plate by first pressing it further in and then withdrawing it.

Combined Generator and Motor (1,276,594).—In the starting and lighting system of William A. Turbayne and Thos. R. Du Bois (both of Niagara Falls, N. Y.) the entire armature and field structure is utilized when operating as a motor, so as to secure a high torque. However, only a portion is utilized when the machine operates as a generator, and this portion is reduced as the speed increases.

Peak-Load Generator Control (1,276,578).—Instead of using storage batteries for taking care of peak loads, Herbert A. Scott (of Saltsburg, Pa.) employs an auxiliary generator and provides an automatic switching arrangement for connecting the latter across the mains when the load reaches a predetermined limit, and for cutting it out again when no longer needed.

Removing Solids from Liquids (1,276,644).—To free a liquid from electropositive particles suspended in it, Victor M. Goldschmidt employs the electronegative character of sulphur, by introducing sulphur and removing the precipitate formed of the original electropositive particles enveloped by the sulphur. The patent was assigned to the Titan Co. of Norway, Christiania, Norway.

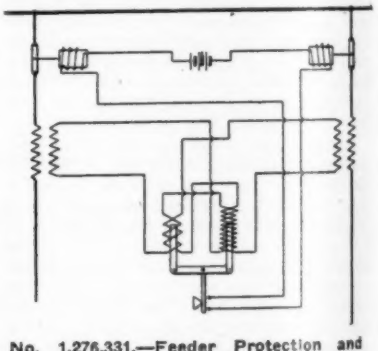
High-Voltage Rectifier (1,275,782).—For rectifying alternating currents of a higher voltage than that for which mercury-arc rectifiers are suitable, Charles P. Steinmetz applies the current to suitable electrodes to produce successive corona discharges, and collects these discharges only when the electrodes are positive. With this in mind, he utilizes the fact that when a high potential is impressed on a metallic point, the corona will extend into the surrounding air for a considerable distance when the potential is positive, while little or no corona will be formed when the potential is negative.

Wall Light (1,276,467).—The familiar suction-cup principle is employed by Herbert Widstrand (of Chicago) for securing lamp sockets to walls. For this purpose he not only uses a vacuum canopy, but also provides magnetic means for exhausting the air from it.

Electro-Steam Radiator (1,276,573). The steam radiator of James J. Rohan and Charles E. Mack (both of St. Louis) not only is electrically heated, but also is so arranged that the resulting steam pressure automatically controls both the supply of water and the action of the electric heating medium.

Synchronizing System (1,276,581).—In the system of this patent, assigned by Charles E. Scribner (of Jericho, Vt.) to the Western Electric Co., current impulses are used for shifting the magnetic field of one of the motors, so as to alter the speed.

Electrical Distribution System (1,276,331).—Some years ago William



No. 1,276,331.—Feeder Protection and Control System.

H. Cole (of Waltham, Mass.) devised an arrangement of relays and balancing transformers for automatically disconnecting a faulty circuit. This later patent describes an allied system which permits current to flow in either direction, but which isolates any one of a group of conductors when the current flowing in it exceeds the maximum, or is less than the minimum, of the values permitted by a predetermined ratio of maximum to minimum current values in the parallel conductors.

Electrical Etching (1,276,600).—An apparatus for electrochemical etching, patented by Joseph H. Weeks, of Rutledge, Pa.

Adjustable Resistance (1,276,384).—Instead of using sliding contacts in connection with a resistance wire, Beverly A. Lundy (of Albany, N. Y.) winds the wire on a spirally grooved insulator and shunts more or less of the wire by means of a metal collar threaded on this grooved insulator.

Men in Service

F. B. Eaves Joins Electrical Equipment Section of War Industries Board — R. P. Askue in Military Service

JAMES B. MINK of the Chicago office of H. M. Byllesby & Co. has joined the Student Army Training Corps at the University of Illinois, Champaign, Ill.

THADDEUS K. MIECZKOWSKI, of the engineering department of H. M. Byllesby & Co., has enlisted with the United States Army as a Russian interpreter.

R. H. MCPHERSON, formerly of the plant department in the Southern Division, Pacific Telephone & Telegraph Co., has received a commission as ensign in the United States Naval Reserve.

H. C. MACPHERSON has resigned his position as superintendent of the electrical lines of the Southern-Pacific Company to enlist in the service of Uncle Sam. Mr. MacPherson has received a commission as captain in the engineering department of the army and expects shortly to leave for France.

WESTERN ELECTRIC COMPANY has added the names of 38 employes to its roll of honor since the publication of the last issue of the News. The company reports that on July 31, 3,675 of its employes were enlisted in various branches of military service, representing 12.3 per cent of the total number of men in its employ, a record of which it may well be proud.

LIEUT. EARL D. WISE, formerly toll engineer, Southern Division of the Pacific Telephone & Telegraph Co., and for the past two years in charge of the field work for the state appraisal, is now on the staff of the chief signal officer at Washington, D. C., where he is looking after the purchase and forwarding of materials necessary for Signal Corps troops in France.

FRANK C. COE, vice-president and superintendent of the C. T. Coe Co., Newark, N. J., is now chief machinists' mate, and recently reached France, where he is stationed at a naval repair base. The C. T. Coe Co. is the manufacturer of the well known Coe turbine blowers and Coe sectional grates. During the absence of Mr. Coe, his duties and responsibilities are being assumed by his father, C. T. Coe, and his sister, Miss Elsie Coe, who is secretary-treasurer of the company.

FREDERICK B. EAVES, who has been field representative of the Bryant Electric Co. in New England, New York State and eastern Canada for the past seven years, has been given indefinite leave of absence in order that he may serve in the electrical and power equipment section of the War Industries Board in Washington. This section is assisting all electrical manufacturers and resale distributors of electrical equipment, apparatus, appliances and supplies to mobilize their resources for direct and indirect war needs. Mr. Eaves will be succeeded by Walter E. Nourse, formerly New England representative of the Square D Co.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

MERL W. BREMER, who prior to his enlistment in Government service, was connected with the electric department of the Pacific Gas & Electric Company, San Francisco, Cal., has been advanced from second to first lieutenant. He is in Company A, 528th Service Battalion Engineers, located at Camp Dodge, Iowa.

ROBERT HORTON, who was employed in the advertising department of the Western Electric Company, New York City, is connected with the 359th Aero Squadron, located at Garden City, and his squadron is doing efficient work in taking apart, testing and rebuilding Liberty motors, for shipment to the firing lines in Europe. This is the first Aero Squadron to be assigned to this particular kind of work as it has always been done by civilian experts in the past.

WILLIAM R. WHITE, formerly superintendent of mails and information bureau of the Commonwealth Edison Company, Chicago, has been commissioned a captain and will be stationed at Washington, having been assigned to the Quartermaster's Corps. Lieutenant White was a member of the Illinois National Guard from 1903, when he enlisted as a private, until 1916, when he resigned as a lieutenant. He was recently lieutenant of Company E, Eleventh Illinois Infantry.

R. P. ASKUE, advertising manager of the Ivanhoe-Regent Works of General Electric Company, Cleveland, O., has been called into active service as a private in the 41st Company, 11th Battalion, 4th Regiment, 159th Depot Brigade, which is at present stationed at Camp Taylor, Louisville, Ky. During Mr. Askue's absence, the supervision of the advertising department will be in the hands of F. J. Blaschke, who will still retain his connection with the publicity department of the National Lamp Works at Nela Park.

A. D. LIKELY, formerly connected with the Redwood District of the Pacific Gas & Electric Company, was recently commissioned a lieutenant in the Aviation Corps of the American forces.

THOMAS J. ENRIGHT, of the fundamental plan division, central engineering department of the Chicago Telephone Co., has entered the service, and is taking a special course of training at the Harrison Technical High School.

CAPT. ROSSWELL C. WILLIAMS, JR., a member of the Electric Club of Philadelphia, was the guest of honor at a recent meeting of the club, at which ways and means for conducting the Fourth Liberty Loan campaign were discussed.

H. J. HANSEN, formerly of the electric distributing department of the Pacific Gas & Electric Company at Oakland, Cal., and now with the 319th Regiment of Engineers at Camp Fremont, has been promoted to regimental supply sergeant, the next highest noncommissioned rank in the regiment.

CAPT. WALLACE W. TRUE, formerly connected with the appraisal forces of the Pacific Telephone & Telegraph Co. at San Francisco, Cal., and who was the first supply sergeant for Company D, Four Hundred and Eleventh Telegraph Battalion, is now stationed at Washington, D. C., in connection with Signal Corps matters.

KEENE RICHARDS, formerly superintendent of Division L of the Public Service Co. of Northern Illinois, was recently promoted to the rank of major in the United States Signal Corps Reserve. Major Richards entered the service as a lieutenant and shortly afterward was made captain. He has acted recently as an instructor in this branch of army work.

LIEUT. CARL C. DEGENHARDT, formerly of the bond department of H. M. Byllesby & Company, and now in the Quartermasters Corps, Washington, D. C., visited Chicago recently on a short leave of absence. Lieut. Degenhardt's present work is in connection with the accounting and distribution of many million dollars worth of Liberty Bonds purchased by men in the United States army. In the Second and Third Liberty loans, Lieutenant Degenhardt helped to sell a considerable proportion of the bonds taken by soldiers.

ELMER DOVER, vice-president of H. M. Byllesby & Co., in charge of the Northwest Pacific Coast properties, has been elected chairman for Pierce county of the committee in charge of the United War Work campaign for the state of Washington. This committee will conduct a campaign during the week of November 11 for the raising of funds for the war work of the Y. M. C. A., Y. W. C. A., Jewish Relief, Knights of Columbus, camp libraries, and war work community service.

Personal

Harry C. Brown Resigns Secretaryship of Contractor-Dealer Association—Harry L. Gannett Expires—Changes

WALTER E. NOURSE, formerly New England representative of the Square D Co., has been appointed field representative of the Bryant Electric Co. in New England, New York State and eastern Canada, succeeding Frederick B. Eaves, who is now engaged in Government work.

C. J. DE BATS, for a number of years manager of the Walkerville (Ont.) Hydro-Electric System and recently manager of the Essex County System, has severed his connection with the Ontario Hydro-Electric Commission, which controls the others, to accept the position of manager of the Bay City (Mich.) municipal electric light plant.

HARRY C. BROWN, secretary of the National Association of Electrical Contractors and Dealers, also editor and business manager of its official journal, *The Electrical Contractor-Dealer*, has

Harry C. Brown.

tendered his resignation, effective Sept. 30. Mr. Brown was for some time assistant secretary of the old National Electrical Contractors' Association of the United States, and upon the resignation of George H. Duffield as secretary in April, 1917, was elected secretary of the association. In January of this year, when the association underwent a complete reorganization, Mr. Brown was elected its national secretary. Members of the organization accept with great regret the resignation of their able secretary, who has freely given his devotion and untiring efforts on its behalf. Prior to engaging in association work, Mr. Brown was for several years connected with the Crouse-Hinds Co., of Syracuse, N. Y., as traveling sales representative with territory extending from coast to coast, a connection which brought him a host of friends in the electrical industry. Mr. Brown has made no announcement of his plans for the future.

HARRY I. BLAKE, formerly connected with the Cumberland Valley Railroad Co., has been appointed superintendent of the Pennsylvania Railroad power plant at Pitcairn, Pa.

RICHARD H. MURRAY, of Lockport, N. Y., chief electrical engineer at the municipal pumping station at North Tonawanda, is critically ill from chlorine poisoning, caused by his work in connection with the purification of the city's water supply.

E. D. LOPER, formerly master mechanic of the Key West Electric Company, Key West, Fla., controlled by the Stone & Webster Management Association, was recently appointed master mechanic of the Columbus Railroad, Columbus, Ga., also operated by the Stone & Webster interests.

H. R. FEHR, president of the Lehigh Valley Transit Co., the Easton Transit Co., and the Lehigh Valley Light & Power Co., the first-mentioned two of Allentown, and the other concern with headquarters at Lebanon, Pa., has been placed in charge of several new electric light, power and gas companies located at Allentown, among which are the following: Northumberland County Gas & Electric Co., operating in Sunbury, Milton and Northumberland; Columbia & Montour Electric Co., operating in Berwick, Bloomsburg and Danville; Harwood Electric Co., operating in Freeland, McAdoo and Hazleton; Stroudsburg Electric Co.; the Schuylkill Gas & Electric Co., operating in Shenandoah and Mahanoy City; Lehigh Navigation Electric Co.; Northern Central Gas Co., operating at Williamsport, and the Hagerstown Light & Heat Co., operating at Hagerstown, Md.

Obituary.

HARRY L. GANNETT, after more than thirty years of service with the Commonwealth Edison and predecessor companies, passed away after an illness of a very few weeks on September 24. Only a few weeks before Mr. Gannett was busily attending to his duties as inspector of safety and fire prevention, a position for which he was particularly fitted. His loss is not only mourned by his family but by almost the entire personnel of the company, and a large number of friends in the central station and electrical industry. Harry L. Gannett, born Jan. 15, 1867, had a long and varied association with the electrical industry in Chicago. He entered the employment of the Western Edison Light Co. on July 1, 1886, serving in the construction department. For many years Mr. Gannett was connected with the customers' service and repair department. At first what became the work of this department was in charge of H. E. Niesz, assistant superintendent of construction. In 1893 Mr. Gannett was appointed foreman of construction and repairs and performed the duties of that office until he was appointed assistant superintendent of construction.

In November, 1894, Mr. Gannett was placed in charge of the repair department. The work increased in volume, and, when the Commonwealth Electric Co. was acquired by Samuel Insull and his associates in 1898, that company engaged the Chicago Edison Co. to do its repair work.

For the last five years Mr. Gannett had given most of his time to the safety organization of the company. In June, 1913, the matter of a safety organization was taken up at a meeting attended by representatives of the Edison, Public Service and Middle West companies, and under date of December 8, 1913, President Insull appointed a central committee on safety of the Commonwealth Edison Co. Mr. (now Colonel) P. Junkersfeld was chairman

Harry L. Gannett.

of this committee, and Mr. Gannett was a member of it. On the same date Vice-President Ferguson appointed Mr. Gannett as inspector of safety and fire prevention, President Insull approving. Thereafter Mr. Gannett took up the work of the safety organization in earnest, and under his direction the number of accidents to person and property was reduced in a very marked degree. In 1914 the American Museum of Safety awarded a gold medal to the Commonwealth Edison Co. as the company which had achieved most for the safety of its employes during the year. Mr. Gannett, in company with C. B. Scott, represented the Edison Co. when the announcement of the award was made at Delmonico's, in New York City.

Mr. Gannett is survived by his wife, two sons, Homer and Winfield (Winfield is with the American expeditionary force in France), and a sister, Mrs. Thomas Severn. He was a Mason and an Odd Fellow.

After the War, What?

V.

Australia Says:

To liquidate the burden of our war indebtedness, the prime essential is the extension and expansion of our industrial life.

It will be necessary for another reason also. There will be employment to be provided for the men returning from the front, and also for the large number of immigrants. It appears too readily to be assumed that these men will be desirous of going on the land. The idea is likely to prove a mistaken one. It is not a large proportion of them that have been engaged in agricultural pursuits, and of the others it is but a slight percentage that will be willing to adopt a mode of life utterly at variance with previous experience.

Ninety per cent of the returned soldiers will want to follow a form of livelihood not distinctly different from that which they pursued before they went off to do their duty to the nation; and of those who wish to change their mode of life, quite as many will be rural laborers who will seek city employment as city men who will want to go on the land.

With this labor and the labor of immigrants to be provided for, it will be the duty of the Commonwealth to enlarge its existing industries, to give elements of permanence to those that have come into being as a consequence of the war, and to establish or to encourage the establishment of new ones.

On the whole it may be said to have thus far made a judicious use of its power. If it were used, not judiciously but harshly and unwisely, it would have the most seriously detrimental effect upon the welfare of the community, because it would hamper established industries and would destroy all incentive to industrial expansion. That is to say, it would be destructive of the most vital of the permanent needs of the Commonwealth."

THE following from an editorial in the "Industrial Australian," might just as well as have been written of conditions in this country. In industrial expansion ***and maintenance,*** good will advertising is the greatest force. Keep it undiminished.

INTERNATIONAL TRADE PRESS, Inc.
C. A. Tupper, President . CHICAGO

Financial News

Utilities' Net Earnings Decline.

Some idea of how the higher operating costs have affected the public utility corporations during the war is to be gained from a compilation of the showing made by 309 companies in that category. The Financial World has figured on the annual reports of that many concerns, and the aggregate gross earnings for a full year amounted to $1,479,940,262, a new high record, and an increase of $256,934,081, or 21 per cent over the gross earnings reported by 325 companies in 1916, and $484,879,730 greater than in 1915. Net earnings, on the other hand, show a considerable decline. The total for the 309 Companies was $526,676,927, a reduction of $24,244,006, or 4.4 per cent when compared with the previous year.

Valuation of Electric Properties Decreased.

Valuation of the Milwaukee Light, Heat & Traction Co. for 1918 shows a decrease of $500,000 below the assessment for 1917, while the Milwaukee Electric Railway & Light Co. shows a decrease of $750,000 according to figures announced by the state tax commission recently.

The preliminary assessment of street railway company and light, heat and power companies operated in connection with them, as constituting the assessment for 1918, shows an increase of $1,461,000 over the 1917 valuation. The companies have until November 1 to ask for a review of the findings. The total valuation for the 26 corporations is $69,917,000, 50 per cent of which is in the two Milwaukee lines.

Lorain County Company Receives Government Aid.

In order to relieve the situation in the Lorain (Ohio) industrial district, where the present power is inadequate for the Government, and other work placed there, the War Industries Board has decided that aid shall be extended the Lorain County Electric Co. in the construction of its power plants now under way. To carry through the plans of the company the Government will make a loan of about $400.000 and will share with the company the war wastage. Officials of the company have shown complete willingness to agree with the Government officials as to conditions imposed in connection with Government.

There is much important War Department and Emergency Fleet Corporation war work under construction at Lorain, Ohio, and the Lorain County Electric Co. was building to meet the increased demands for power.

Rochester Light Notes Offered.

J. P. Morgan & Company, announces that it, together with the First National Bank, the National City Company, and Harris, Forbes & Company, has purchased and is now offering an issue of $3,900,000 Rochester Railway & Light, general mortgage, three-year 7 per cent bonds at 98 and interest to yield about 7¾ per cent. The proceeds of this issue are to be used to reimburse the company for expenditures made, for new construction necessitated by recent increased demands for power due to contracts for government work in Rochester and surrounding country.

The issue has been passed by the Capital Issues Committee and duly authorized by the Public Service Commission of the second district of New York.

Pennsylvania Electric Notes.

The Pennsylvania Electric Company, operating the Citizens' Light & Power Company, and its subsidiary the Citizens' Light, Heat & Power Company of Pennsylvania, both at Johnstown, Pa., has arranged for a five-year note issue of $1,500,000 for expansion and general extensions, with approval of the Capital Issues Committee. The company furnishes electric service at Johnstown, Blairsville, Clearfield, Somerset, Franklin, Glen Hope and surrounding territory. Headquarters are in the Du Pont Building. H. D. Walbridge is president.

Earnings.

PENNSYLVANIA UTILITIES COMPANY.

August—	1918.	1917.
Operating revenues	$ 132,418	$ 96,460
Operating expenses and taxes	98,287	84,920
Operating income	$ 34,131	$ 11,540
8 months ended August 31—	1918.	1917.
Operating revenues	$1,017,137	$ 743,968
Operating expenses and taxes	758,804	609,601
Operating income	$ 258,233	$ 134,367

PACIFIC GAS & ELECTRIC.

For August—	1918.	1917.
Gross revenue	$1,991,397	$1,614,988
Total net earnings	579,188	552,231
Surplus after dividends	95,780	71,530
For the 12 months ended August 31—		
Gross revenue	21,369,520	19,367,684
Net earnings	6,988,356	7,448,629
Total income	7,465,210	8,003,038
Surplus after dividends	1,660,928	2,383,750

COMMONWEALTH POWER.

The earnings statement of the Commonwealth Power, Railway & Light Co. and its constituent companies for August shows gross increased 17.47 per cent; operating expenses, increased 23.31 per cent, and net earnings, increased 9.20 per cent. For eight months, gross increased 12.45 per cent; operating expenses, increased 25.65 per cent, and net earnings, decreased 3.76 per cent. For 12 months ended August 31 last gross increased 14.46 per cent, operating expenses increased 28.40 per cent, and net earnings decreased 1.76 per cent.

Dividends.

Western Power Co. has declared a quarterly dividend of 1 per cent on preferred stock, payable October 15 to stock of record September 30.

Bell Telephone Co. of Pennsylvania has declared a quarterly dividend of 1½ per cent, payable October 15 to stock of record October 5.

United Railways & Electric Co. has declared a cash dividend of 50 cents, payable October 15 to stock of record September 28.

A quarterly dividend of 1¾ per cent has been declared by the Westinghouse Electric and Manufacturing Co., payable October 31 to stock of record October 4; also a quarterly dividend of 1¾ per cent on preferred stock, payable October 15 to stock of record October 4.

Manufacturers Heat & Light Co. has declared a quarterly dividend of 2 per cent, payable October 15 to stock of record September 30.

The board of directors of the Northern States Power Co. has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company, payable October 21 to stockholders of record September 30, 1918.

The General Electric Company has declared the regular quarterly cash dividend of 2 per cent, payable October 15 to stock of record September 14.

American Light & Traction Co. has declared quarterly dividends of 2½ per cent in cash, also 2½ per cent in stock, payable November 1 to stock of record October 11.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Sept. 24.	Bid Oct. 1.
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	..	..
American Gas & Electric of New York, common	10+extra	79	79
American Gas & Electric of New York, preferred	6	39	39
American Light & Traction of New York, common	..	177	177
American Light & Traction of New York, preferred	6	91	91
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	68	68
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	33	34
American Telephone & Telegraph of New York	..	97	98
American Water Works & Elec. of New York, common	..	4½	4½
American Water Works & Elec. of New York, particip	7	11	11
American Water Works & Elec. of New York, first preferred	..	57	56
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	20	20
Cities Service of New York, common	+extra	208	217
Cities Service of New York, preferred	6	71¾	71½
Commonwealth Edison of Chicago	8	101	101½
Comm. Power, Railway & Light of Jackson, common	..	18	19
Comm. Power, Railway & Light of Jackson, preferred	6	36	36
Federal Light & Traction of New York, common	..	7¼	7¼
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	16	16
Middle West Utilities of Chicago, preferred	6	38	38
Northern States Power of Chicago, common	..	43	43
Northern States Power of Chicago, preferred	ex.div.7	81	81
Pacific Gas & Electric of San Francisco, common	..	33	36
Pacific Gas & Electric of San Francisco, preferred	6	77½	78
Public Service of Northern Illinois, Chicago, common	7	75	77
Public Service of Northern Illinois, Chicago, preferred	6	80	78
Republic Railway & Light of Youngstown, common	4	15	15
Republic Railway & Light of Youngstown, preferred	6	55	55
Standard Gas & Electric of Chicago, common	..	4½	4½
Standard Gas & Electric of Chicago, preferred	6	21	..
Tennessee Railway, Light & Power of Chattanooga, common	..	2	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	12	12
United Light & Railways of Grand Rapids, common	4	29	27
United Light & Railways of Grand Rapids, preferred	6	59	58
Western Power of San Francisco, common	..	11	11
Western Power of San Francisco, preferred	6	48	48
Western Union Telegraph of New York	extra	82	82
Industrials—			
Electric Storage of Philadelphia, common	4	49½	49½
General Electric of Schenectady	8	147	149
Westinghouse Electric & Mfg. of Pittsburgh, common	7	43	43⅛
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	58	58